SA/EPU/H/1/1/3

# CLEANER CITIES

CASTLE DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use:—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Wagons, &c.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are thoroughly suitable for use in modern mechanical stokers.

# BRIGHTER HOMES

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no smoke, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes to suit various requirements:—

No. 1. Cobbles, for [illegible] and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, &c.

For further particulars apply to:—

## STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED

4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3

Branches:—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull, Newcastle-on-Tyne, Glasgow, Belfast.

# CLEANER CITIES

POWELL DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use :—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Lorries, etc.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are eminently suitable for use in modern mechanical stokers.

# BRIGHTER HOMES

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no soot, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes for various requirements :—

No. 1. Cobbles, for horticultural use and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, etc.

*For further particulars apply to :—*

**STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED**

**4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3.**

And at :—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull,
Newcastle-on-Tyne, Glasgow, Belfast.

# BURN CHEAP COAL

## WITH AUTOMATIC CONTROL

**SMOKELESSLY, EFFICIENTLY, ECONOMICALLY**

FOR

CENTRAL HEATING

IN THE

PRIOR MASTOKER

*Ask for descriptive Leaflet from*

**SAUNDERS & TAYLOR LTD.**

Praed Road, Trafford Park, MANCHESTER.

**Telephone Trafford Park 2007** (3 lines)

---

# OIL OR COAL?

ACCORDING TO CIRCUMSTANCES EACH HAS ADVANTAGES
EACH CAN BE SMOKELESS IF PROPERLY BURNT

THE

**"PRIOR"**
OIL FIRING SYSTEM

THE SIMPLEST **OIL** BURNER IN THE WORLD

**Some of its Advantages:**

Low Air Pressure
Gravity Feed for Oil
No Small Jets
No Moving Parts in Burner
Soft Enveloping Flame
Flame Regulation Range 8 to 1
Thermostatic Control optional

*Let us send Particulars.*

THE

**PRIOR**
**MASTOKER**

A FULLY AUTOMATIC
UNDERFEED COAL STOKER
**FOR HEATING and DOMESTIC BOILERS**
*which effects*
A GUARANTEED SAVING of **25%** to **50%** as compared with hand stoking

Under Complete Thermostatic Control

Absolutely Reliable

**We invite you to see it working**

**THE PRIOR OIL BURNER LTD.,**
**5 CROWN YARD, STANHOPE ST., LONDON, N.W.1.**

CARDIFF AGENTS—
HAMPTON'S HEATING CO., LTD.,
18 CITY ROAD, CARDIFF.

MASTOKER AGENTS FOR MANCHESTER—
SAUNDERS & TAYLOR, LTD.,
PRAED ROAD, TRAFFORD PARK.

# The Journal of the National Smoke Abatement Society

*Editor :* **Arnold Marsh, M.Sc.Tech.**

*Editorial Office:*
**23, King Street**
**Manchester**
**Telephone : Blackfriars 0896.**

*Advertisement Office:*
**The Service Guild**
**45, Deansgate Arcade, Manchester**
**Telephone : Blackfriars 9374**

Vol. 3. No. 9. 1932.

## CONTENTS OF WINTER ISSUE

| | Page |
|---|---|
| Smoke and the Cost of Living .. .. .. | 103 |
| A Survey of the Smokeless Solid Fuels—<br>v. Low Temperature Smokeless Fuel, by Col. W. A. Bristow .. .. .. | 105 |
| Council Meeting : Resolutions on Regional Smoke Abatement .. .. .. .. | 106 |
| News and Notes .. .. .. .. .. | 109 |
| Liverpool Conference :<br>Notes on the Production of "Dryco" in Liverpool, Ralph E. Gibson .. .. | 110 |

*The Journal is open for the free discussion of all aspects of the smoke problem, and the opinions expressed in contributed artilces are not necessarily the same as the views of the Society. Quotation and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgments are made.*

# Smoke and the Cost of Living.

MR. Henry Ford, for the purpose of comparing the value of the wages paid to his employees in different countries, has had a list prepared showing the cost of living in fifteen representative cities of the world. Manchester, an English city in which one of Mr. Ford's works is situated, is shown to be cheaper than nine of them. This relatively favourable position has prompted the *Manchester Guardian* to ask where Manchester would be if the costs due to the smoke nuisance, which are borne by every family, were included in the estimate.

The cost of smoke in the British industrial centres is certainly higher than in many of the corresponding continental districts where regulations are stricter and there is little domestic smoke. Of the conditions in Detroit we are not certain ; but, judging from the occasional bursts of controversy and intermittent propaganda from different parts of the United States, there is still a general and considerable nuisance in that country.

It is unfortunate that funds have never been available in Britain for conducting a thorough and precise investigation into the actual monetary cost due to smoke. The exact and complete figure is, of course, unattainable, but that a reliable and sufficient estimate can be determined was shown by the Pittsburg inquiry of 1912, when it was indicated that the cost to the inhabitants was $20 per annum. Recent statements assert that the present cost per head in the U.S.A. is $16 per annum. To place the average yearly cost in Britain at £2 her head, which is generally accepted as a reasonable estimate, is consonant with these and with the few definite figures that have been obtained in this country. For instance, the present cost for Manchester is approximated at £2,900,000 ; and there is one item of this admittedly theoretical figure which has not only been obtained exactly, but which has been confirmed by chartered accountants ; namely, that the cost of the household washing in the city is £242,000 above what it should be. When a single item runs to such a sum it is not difficult to realize that the estimated total cannot be excessive; nor that the frequently quoted total of £80,000,000 for the nation is an unreasonable amount.

The national total seems much more formidale than when the same thing is stated as a £2 tax borne by every individual, or as £10 per family. But to millions of people this is a very considerable sum, and a matter of four shillings a week may mean all the difference in the world to whether the household budget is to have a favourable or unfavourable balance. And those more fortunate, who would not notice such a trifling amount, would probably on examination, find that their expenditure due to smoke, because of a higher standard of living, is correspondingly greater.

There is ample evidence, in every direction, that the smoke nuisance, wherever it is found, considerably increases the cost of living. Yet because the separate items are small and frequently invisible (as in the costs borne by industry and commerce and ultimately borne by the consumer), or because they are regarded as natural factors inseparable from the modern social order, their cumulative effect is but dimly realized and still less understood.

It is remarkable that in a period of financial stringency and economic retrenchment so little attention should be given to the continuous destruction of real wealth brought about by the smoke nuisance. The economic aspect of the problem is of great importance and no opportunity should be lost, on the part of the readers of the JOURNAL, for stressing the grotesque waste that is occasioned by this general toleration of coal smoke.

To judge from the plight of the world at the present time it would seem that it is extremely difficult for all but experts to understand the economic realities underlying any action; and even the experts differ. Our own special problem is, however, simple to consider from this point of view, and can hardly provoke any dissent.

The waste due to the formation and emission of coal smoke is triple. There is first the loss of potential wealth which could have been produced by the pre-treatment of the coal instead of its combustion in the raw state, although this cannot be truly estimated and constitutes an unknown value which is not included in the present consideration. Secondly, there is the waste of these portions of the coal substance considered simply as fuel: the efficient combustion of coal is smokeless. Then thirdly, the smoke, which has already created a loss as a source of either products or of energy, becomes an active agent for the destruction of wealth and the production of ill-health and disease.

What precisely is meant by the statement that £80,000,000 is lost to this country every year as a result of the fuel wasted as smoke and the further waste caused by the smoke? A contemporary journal some time ago asked where the money would be found at the end of the year, obviously thinking upon the fallacious lines of the actual circulation of the cash and a superficial production of employment. What actually happens is that £80,000,000 worth of labour is expended without that production of new wealth which is the purpose of labour. As quoted in the Samuel Commission on the Coal Industry, the labour of over a million men for three days of the year is devoted to providing the soot which pollutes our atmosphere; and the rest of the sum is spent in maintaining existing economic wealth against the ravages of the polluted atmosphere instead of being utilized for the creation of new wealth—property, commodities and goods of all kinds. In other words, the effect is the same as if the eighty millions were spent in building and equipping a new city which was to be destroyed as soon as it was completed.

Abolish the smoke nuisance and the nation would find, in effect, thus useful sum added to its annual income. If left with the individual who now unconsciously pays it in the form of an invisible tax, it would markedly raise the standard of living. If used by the nation or by the municipalities it could either reduce income tax by one-third or rates by one-half. Or it could enable us to forget the Sinking Fund; and even, if need be, would balance a moderately obstinate Budget. We could also consider the capital sum of which this is the annual payment—but we shrink before the conception; preferring to commend it to the attention of a Chancellor of the Exchequer who was at one time a Minister of Health.

---

**Mr. J. W. SEFTON.**

There are many engineering firms in this country whose product or appliance might profitably be brought to the notice of municipal authorities, with a view to being adopted as a smoke-abating measure. Mr. J. W. Sefton, the sole advertisement representative of this Journal, has made very full and thorough inquiries into the *practical* steps which many municipalities are prepared to take, in their efforts to reduce the smoke nuisance. Personally acquainted with medical officers of health and borough engineers in many large town, Mr. Sefton is well-informed on their requirements, and is able to supply much useful information as to the methods most favoured. Reliable data on the experiences of municipal officers with measures already adopted, is most valuable, and Mr. Sefton willingly offers this service, without obligation to the inquirer. His address is:—

**26, WOODHILL DRIVE, PRESTWICH,**
**MANCHESTER.**

# A Survey of the Smokeless Solid Fuels—

## V. Low Temperature Smokeless Fuel.

By COL. W. A. BRISTOW, CHAIRMAN, LOW TEMPERATURE DISTILLERS' ASSOCIATION OF GREAT BRITAIN, LTD.

It is hardly too much to say that the social life of England has grown up around the open fireplace. There are those who would say that this is mere sentiment, a habit which education and progress will enable us to shake off, but this is very doubtful. We have only to look at our pictures and advertisements, Christmas cards, and pictorial representations of all times to see that English home life is centred around an open glowing coal fire.

Quite apart from the social side of life, which has a considerable effect upon the health, cheerfulness and courage of the people, there is a very marked advantage with the open grate from a purely physical point of view. A chimney constitutes a wide ventilating shaft with an ever-ascending current of air renewing the atmosphere of the room, with an incinerator constantly devouring the impurities and suspended matter, and with a large amount of radiant heat coming out upon the occupants. These advantages are incomparably superior to those which can be obtained by any method of central heating.

The last ten years have witnessed a growing revolt against the danger, dirt and inconvenience of burning raw coal and an increasing demand for those things that make domestic life easier and cleaner. Far-seeing people have pointed out the widespread damage to health and property which is caused by the burning of raw coal. This campaign has been strengthened by the efforts of the Medical Officers all over the country who are indefatigable in their expositions of the dangers arising from this practice.

With the ever-growing refinement in furnishings, with the substitution of silks and laces of black horse-hair and red plush, the visits of the sweep have become increasingly unpopular, and there must be any number of people who have been insensibly driven towards the adoption of cleaner forms of heating, merely by reason of the dirt and dissatisfaction which they have experienced from the use of raw coal.

During the last few years, therefore, the coal fire has been assailed from many quarters, various forms of domestic heating have been largely advertised and very little defence has been put up by the open grate.

It must be recognised that in many houses there must occur periods during which heat is required in some room for quite a short time, a period so short that it is not worth while lighting a fire. For such cases a gas stove affords a very good substitute, and in addition provides a certain amount of ventilation. There is also the electric radiator, which has the advantage of being portable. This method of heating, however, is very expensive to run for long periods and the very fact that no chimney is required demonstrates that no ventilation is thereby effected.

For evey-day use in the living rooms of our homes an open fireplace is essential if the well-being, health and comfort of the occupants are to be considered. It is equally important, however, to the occupants of the neighbouring houses that the fuel burnt should be smokeless.

The manufacture of low temperature smokeless fuel has now been firmly established on a commercial basis. This fuel which is sold under various trade names, commands a wide market and can to-day be obtained from every coal merchant throughout the United Kingdom.

The manner in which the technical difficulties have been overcome in the making of low temperature smokeless fuel should be of considerable interest to the general public. It is not generally realised that on the average some 35% of the total coal mined in Great Britain reaches the pit-head in the form of smalls and dust. This coal dust, which forms the raw material of the majority of low temperature plants, has the same calorific value and therefore the same intrinsic value as large-sized coal from the same seam—and it is only cheap on account of its size. The consumer of smokeless fuel is not concerned with the quality of the material that is fed to the retorts, providing that the system of carbonizing enables the resultant product to be delivered to his cellar in lumps of convenient size for handling and burning.

A suitably designed low temperature retort ensures that this object is achieved, and thus the financial status of the small coal is automatically raised to the level of that of large size best house coal.

The following is an analysis of a typical washed coal and of the smokeless fuel produced therefrom :—

| | Coal (Washed Smalls) | Smokeless Fuel |
|---|---|---|
| Fixed Carbon .. | 55.01 | 86.28 |
| Volatiles .. .. | 32.29 | 6.01 |
| Ash .. .. | 3.82 | 5.03 |
| Sulphur .. .. | 1.02 | 0.96 |
| Moisture .. .. | 7.86 | 1.72 |
| | 100.00 | 100.00 |

It will be observed that the smokeless fuel is very similar in composition to anthracite, containing about 5% less carbon and 5% more volatile matter. The inclusion of the latter is of vital importance and gives to the smokeless fuel its great advantage over anthracite for lighting and burning in the open grate. The cellular construction of the semi-coke also helps largely in this connection.

One of the chief necessities in manufacturing smokeless fuel is to turn it out of the retort in structure strong enough to withstand the many handlings it receives before it reaches the consumer's fire. There is the process of transferring it from retort to screens, screens to truck, shaking about on the journey, unloading on to wharf, putting into bags, loading on to vans, shooting into user's cellar, storing and shovelling into scuttle. Unless the fuel is strong and well knit the amount of dust and smalls in the last stage will be so great as to be prohibitive. Experience of full scale working during the last four years, aided by concentrated research work, has enabled the industry to satisfactorily overcome this formidable array of opposing factors.

Smokeless Fuel has one apparent disadvantage over coal in that it has about twice as much bulk, weight for weight. Actually however in practice this fact proves to be a very distinct advantage. Smokeless Fuel, like coal, is bought by weight but used by volume and the much larger bulk of Smokeless Fuel means that when compared with coal ton for ton it goes much further.

Experiments have been carried out with regard to the effects of frost, snow and rain on smokeless fuel stored in the open, but the burning qualities are not impaired by any amount of exposure. It was thought at first that because of its cellular character the fuel would absorb very large quantities of water, but actually it absorbs very little, if any, more than coal, because the cells do not communicate with one another. Consequently a piece of smokeless fuel immersed in water will remain dry inside, and owing to the nature of the exterior the surface water will dry off very quickly after contact.

It is very important in making smokeless fuel to keep the ash content as low as possible. With any given coal much of the ash of one ton will ultimately be found in the resulting 14cwt. of smokeless fuel, and it is therefore necessary to wash the coal in order to get the original ash to the required figure. Any manufacturer making smokeless fuel from smalls must either establish a washery or see that the collieries thoroughly wash the coal before despatch. There are various methods of separating the ash from the coal—some by dry washing, but there are very few methods which give a really good cleaning combined with the minimum loss of coal during the operation.

Following upon the washing is the necessity for a certain amount of drying as the coal must not contain more than a given quantity of moisture when loaded into the retort, otherwise the process of distillation is impaired and other difficulties follow.

Above all is the necessity for manufacturing a standard product uniform in quality and of the very best. It is a strange trait in human nature, and yet one that persists very strongly, to accept the evils we are accustomed to without a murmur while criticizing with considerable heat anything that is put before us as a remedy. Users of coal have been long accustomed to wide variation in quality, size, and percentage of smalls, and will tolerate ash, stone, slate and all the other drawbacks with which we are so familiar. But experience shows that if a new convert to smokeless fuel finds one piece in his cellar which does not conform with his ideal standard, he will send it to the offices of the Company concerned by registered post with four pages of complaint.

As this article is primarily intended to deal with smokeless fuel, little reference has been made to the by-products incidental to its manufacture. They are, however, very important, and their production complicates the process of manufacture still further. From each ton of coal distilled in an externally heated fixed retort, the average yield of by-products may be taken as follows :—

| | | |
|---|---|---|
| (*a*) | Smokeless fuel .. .. | 14cwts. |
| (*b*) | Coal Oil .. .. | 18 gallons. |
| (*c*) | Crude Coal Petrol | 2—2½ gallons. |
| (*d*) | Gas .. .. .. | 4,000—4,500 cu. ft. at 750 B.Th.U.'s per cubic foot. |

In developing the main process care must be taken to ensure that the coal oil does not contain water that cannot be separated out, or free carbon, nor must it have been cracked by local excesses of temperature. Likewise the heavier fractions must be so controlled that the mains and pipes are always open without having to be constantly cleaned out. The motor spirit must be made in such a form that refining is easy, with little loss, and that the product is of good odour and water-white. It must possess a high proportion of aromatics (anti-detonating constituents) and must not form gummy deposits when stored. Generally speaking the by-products have to be made of such a character that the price realised for their sale shall, combined with the price realized for the smokeless fuel, provide for the cost of the process and profit. This is an extremely important branch of the manufacture, and volumes could be written of the research and experiments that have been undertaken in the past few years in order to overcome what at one time appeared to be almost insuperable difficulties. These difficulties, however, are now in the past. Specifications have been established and the various oils, spirits, and tar acids command a ready market among refiners and distillers all over the country.

---

**WANTED** immediately, a copy of Eleventh Report of the Committee for the Investigation of Atmospheric Pollution, for the year ending March 31st, 1925—N.S.A.S., 23, King Street, Manchester.

---

# Council Meeting: Resolutions on Regional Smoke Abatement.

At a Meeting of the Council of the Society held in York on January 26th, 1932, the following resolutions and explanatory preamble were submitted on behalf of the Executive Committee, and were adopted. In accordance with Resolution 4 the text, as follows, is being sent to the Minister of Health, Local Authorities, and existing Regional Committees :—

**PREAMBLE.**

1. Following the recent discussion on Regional Smoke Abatement at the Liverpool Conference, and similar discussions elsewhere, it is considered that the attitude of the National Smoke Abatement Society with respect to this important aspect of the administration of smoke abatement legislation should be more clearly defined and its attitude towards future developments stated.

2. Powers exist under the Public Health Acts by which united districts for the purposes of smoke abatement may be constituted. Up to the present only one such joint administrative district, the Sheffield, Rotherham, and District Smoke Abatement Committee, has been formed. The institution of a South-east Lancashire Joint Smoke Abatement Board has been proposed by the Manchester and District Regional Smoke Abatement Committee ; but further steps have been temporarily suspended owing to the present financial difficulties.

3. During the last few years Regional Committees of an advisory nature have been formed by local authorities in the Midlands, West Riding of Yorkshire, and Manchester and District. A joint committee of a rather different character has been formed in London.

# GAS COKE

## Saves 50% on a London Laundry's Fuel Bill

*"You asked me to let you know if I found any advantage was gained from the alterations to the Boiler furnaces and the change of fuel."*

*"Both Boilers have been fitted with Turbine Furnaces since the middle of June and since the beginning of July the fuel burned has been entirely Coke Breeze and Gas Coke. Previously the fuel used was . . . ."*

*"With the old Furnaces and fuel used, I find that the average cost of raising steam at this time of the year was approximately £16 per week. With the Turbine Furnaces and using your Breeze and large Gas Coke the cost per week is approximately £7. To this £7 must be added about £1 per week for extra wages . . . all the above figures have been carefully computed . . . The work done in the Laundry has been slightly heavier since the installation, thus showing further advantage in favour of the alteration on the comparison."*

(The original letter can be inspected).

This is one specific instance of money-saving following the use of Gas Coke. There are numerous other cases, in none of which was any alteration made to the Furnaces, where substantial savings have been made, following the co-ordination of the needs of users with the guidance of our Technical Department.

A saving or 50% may not be possible in your particular case but if you will state your problem, we will, without obligation, work on it and show how saving may be affected in your business, by using Gas Coke, *without any alteration to your Furnaces,* be it for Steam-Raising or Water-Heating, for Central Heating or Oven Furnaces.

**SEND FOR THE NEW, ILLUSTRATED BROCHURE, CONTAINING INSTRUCTIONS ON THE ART OF SUCCESSFUL BOILER-FIRING**

A copy of this Technical Brochure, "Smokeless Gas Coke for Central Heating and Steam-Raising" will be gladly sent free, on application. It gives concrete examples of economies which have been effected through the use of Gas Coke in undertakings ranging from Hospitals to Power Stations. It contains also the reports and statistics of independent tests. Write or 'phone to:

THE LONDON & COUNTIES COKE ASSOCIATION,
9 GROSVENOR GARDENS, S.W.1. VICTORIA 3666.

Or you can apply to THE COAL MERCHANTS' FEDERATION,
7 Victoria Street, S.W.1. - - - - Victoria 5005.

**Gas Coke: the ALL-BRITISH *smokeless* fuel**

**COKE FIRES**

**Smokeless**
**Labour-**
**Saving**
**Economical**
**Attractive.**

*Write or Telephone to :-*

**C. H. Kempton & Co. Ltd.**

72, BENNERLEY ROAD,
S.W. 11
BATTERSEA 4991

Head Office :-
STANGATE HOUSE,
WESTMINSTER BRIDGE RD.,
S.E. 1.

4. The administration of the law relating to smoke emission varies considerably throughout the country. In a large number of cases the law is either completely ignored or is put into operation only intermittently and ineffectively. In other cases it is primarily effected by observations taken by Sanitary Inspectors, the duties of whom have increased so enormously since 1875 that it is a practical impossibility to obtain effective observations of smoke emission by an official whose time is fully occupied by other numerous and urgent daily duties which are now required. Only in the larger cities and boroughs is it possible to provide for the service of whole-time smoke inspectors. Further, the time-standards of smoke emission vary from district to district, which, coupled with the differences in administration, result in highly anomalous situations.

5. As an illustration of the results of this rather chaotic state the figures issued by the Manchester and District Regional Smoke Abatement Committee may be cited. 536 observations in which dense black smoke was recorded were made in Manchester and the same number in 33 surrounding districts. To obtain these observations took 1,300 working days in Manchester and 42 working days in the outer districts. The average black smoke emission per half-hourly period was 1.8 minutes for Manchester and 9.2 in the 33 other areas. In Manchester 71.3 per cent. of the emissions were for less than two minutes, but only 3.7 per cent. for the other areas. The corresponding figures for 10 to 20 minutes emission were 1.5 per cent for Manchester and 32.5 per cent. for the other areas.

6. The cost of administration by a statutory regional organization is likely to be much less than the cost of an *equivalent service* carried out by the constituent authorities individually.

7. Educational work both with respect to industrial and domestic smoke is at present carried out to a limited extent by the Advisory Committees and by a few local authorities. The importance of this work and the desirability of a considerable extension cannot be stressed too strongly; and again this could be undertaken by a regional organization more effectively and economically.

8. The successful working of a statutory body known as the Sheffield, Rotherham, and District Smoke Abatement Committee shows that there are no insurmountable difficulties in the way of these developments. The scheme prepared in detail for the formation of a South-east Lancashire Joint Smoke Abatement Board also shows that, technically at least, no serious difficulties are anticipated in that scheme.

9. It must be admitted that a considerable period may elapse before there is a general establishment of statutory regional organizations throughout the country. Attention may therefore be drawn to the desirability of forming Advisory Committees in those areas which are suitable for such a purpose, but in which, up to the present, there has been no such action. The existing committees cover only a relatively small area of the industrialized parts of the country.

10. Two further points may be stated briefly :—

(*a*) Smoke knows no boundaries; and the efforts of one authority may therefore be largely nullified by the inaction of adjoining authorities.

(*b*) The present system has been in operation for 56 years and is unlikely to lead to greater successes than have been achieved.

### THE RESOLUTIONS.

In view of the gravity of this question in relation to smoke abatement generally and the desirability of directing further attention to it with a view to the necessary action being taken, the following resolutions were submitted by the Executive Committee to the Council for approval :—

> The Council of the National Smoke Abatement Society, having considered the administration of the law relating to Smoke Abatement in this country and having noted the grave defects inherent in the present system RESOLVES
>
> (1) THAT Local Authorities be urged to combine for the purpose of setting up suitable statutory regional organizations for the administration of smoke abatement law;
>
> (2) THAT, pending the formation of statutory regional organizations Local Authorities be urged to establish Advisory Committees similar to those already in existence; and
>
> (3) THAT the support of the National Smoke Abatement Society be given to such projects as will further these proposals.
>
> (4) The Council further resolves that copies of these Resolutions and of the accompany Preamble be sent to the Minister of Health, to the existing Regional Committees, and to the Public Health Committees of all Local Authorities concerned, requesting the last to discuss the proposals and to signify approval and support of their substance.

It was agreed that the Resolutions be adopted.

# News and Notes.

### "The Dirty Picture in the Golden Frame."

Cerebro-spinal fever and smoke abatement were the two subjects discussed at a meeting of the Royal Sanitary Institute in Sheffield on November 27th. A paper by Councillor W. Asbury (a member of the Executive of the N.S.A.S.), who was unable to be present, was read by Dr. J. Rennie, the Medical Officer of Health to Sheffield.

He said that scientific knowledge was not sufficiently advanced to enable them to gauge with accuracy the extent of human suffering caused by atmospheric pollution, but they did know that dwellers in industrial cities had lungs like those of a coal miner. They heard on every hand much about the necessity for economy, and it seemed to him a useful start might be made in the direction of re-examining the conditions, human and economic, for which atmospheric pollution was largely responsible.

He referred to the good work done by the Smoke Abatement Committee, and the capable assistance received from Professor Desch and Professor Wheeler, and the co-operation of the manufacturers.

A second paper was given by Mr. James Law, Chief Inspector to the Sheffield, Rotherham and District Joint Committee. He said that John Ruskin called Sheffield "The dirty picture in the golden frame." Whose fault was it that it was still so to-day?—the people who worked and resided there, not only manufacturers, but housewives and every individual. Manuturers said that progress was being retarded by lack of capital. The greatest economic step the manufacturers could take was to put their furnaces in order, and so reduce their fuel bills and their smoke, and this would to a considerable extent help them to produce at competitive prices. Most of the atmospheric pollution in the area was caused ny metallurgical furnaces. A considerable number were so badly constructed that there was no possible method of controlling the fuel and air supplies to them. They offended every law of combustion, and in their present state, would never be any better.

The Public Health (Smoke Abatement) Act, 1926, gave a qualified exemption to all metallurgical processes for a period of five years. It was hoped that the exemption would give the manufacturers an opportunity, so that at the end of the period local authorities could come forward and state that there was no further necessity for the exclusion of any class of manufacture. From general observations it would appear that the majority of manufacturers had been content to "wait and see" rather than attempt improvements.

In the discussion Councillor F. Lloyd pointed out that the smoke emission per ton of steel produced was very much less than half of what it was ten years ago and manufacturers ought to have some credit for that.

Mr. H. C. Armstrong (Thos. Firth and John Brown, Ltd.), said he was satisfied that eventually they would learn how to heat special steels without either the use or emission of black smoke. To reconstruct furnaces would cost about 30s. per ton of coal burned per annum, which was a very large sum of money to spend in altering furnaces. He contended that it was impossible and unfair to ask a colliery to be smokeless. If collieries were forced to burn better coal for their plants, coal would cost more. Until they had learnt how to burn up their coal they ought to have more licence than other people.

Most of the discussion was contributed by representatives of the manufacturing interests, and in its general level gave an indication of what is perhaps one of the principal reasons why the picture in the golden frame continues to be dirty.

### The Most Important Public Health Problem.

Dr. T. W. Naylor Barlow (Medical Officer of Health for Wallasey), and Coun. Pike, of Finchley, (Secretary of the Garden Cities and Town Planning Association), addressed a meeting in the Town Hall, Manchester, on November 26th, promoted by the Manchester and Salford Women Citizens' Association, and the Manchester, Salford, and District Branch of the National Smoke Abatement Society. The Lord Mayor (Councillor Ellis Green) presided. Dr. Naylor Barlow referred to the fall in the death-rate from various diseases in recent years, but said that respiratory diseases rate had not shown the same tendency to fall. Respiratory diseases were intimately associated with atmospheric pollution. The cleansing of the atmosphere was the most important public health problem of the present day. If by some chance the air could be cleared he thought that there was not a single thing which would have a bigger effect on the health and happiness and contentment of the people.

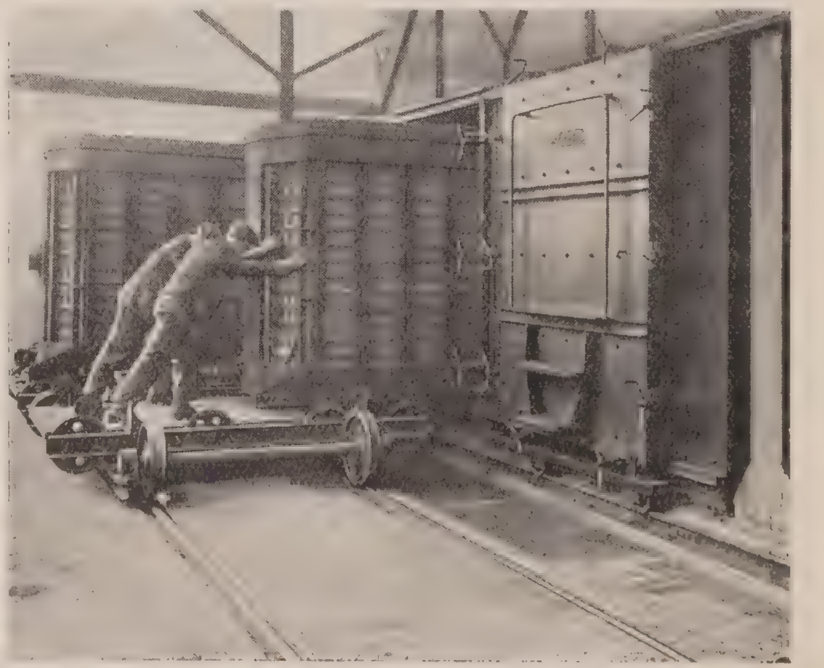
How was the problem to be solved? Education was of the first importance. It was an exceedingly difficult thing to get people interested in health as an abstract question. The conditions which predisposed to illness also subtracted something from the maximum of health we might enjoy. Fog worsened chest diseases from which so many people died every year, and the principal cause of fog was smoke in the atmosphere. A dirty atmosphere not only caused illness and death but detracted from the health of those who could not be called ill.

**LIVERPOOL CONFERENCE.**

# Some Notes on the Production and Use of the Smokeless Fuel "Dryco" in Liverpool.

BY R. E. GIBSON, M.INST.C.E., M.INST. GAS E.

### ntroductory.



COKE CONTAINER ENTERING SULZER CHAMBER.

It is satisfactory to note that as a result of the persistent advocacy of smoke abatement by this Society and its predecessors, public opinion is being slowly but surely formed in favour of the use of smokeless fuel. That there is wide scope for the extension of the sale of such fuel is obvious when one is informed that some 23% of the coal used in this country, amounting to 40 million tons, is still used in the raw state for domestic purposes. Many attempts have been made to produce mokeless fuels which would find a ready sale in place of raw coal but only, so far, with very limited success. For certain purposes gas coke and oven coke are suitable but for various reasons they do not give entire satisfaction when burnt in the open domestic grate. The The advocates of low temperature carbonization have for many years devoted much time, money and energy in producing low temperature smokeless fuels. While their efforts have been successful in producing fuels which in most respects meet the requirements, they have so far unfortunately failed to make satisfactory progress on a large scale on account of the fact that the processes have been difficult to establish on a satisfactory commercial basis.

W-D

## Our Ideal
## "A Smokeless City"

The

**WOODALL-DUCKHAM COMPANY**

are

manufacturers of

**Continuous Vertical Retorts**

**Intermittent Vertical Chambers**

and

**Other Plants**
for
**Conserving Coal**

and

**Providing Smokeless Fuels**

Head Office:-

ALLINGTON HOUSE 136-150 Victoria St., LONDON, S.W.1

District Offices:-

GLASGOW
82 Gordon St..

SHEFFIELD
22 High St..

*THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO.. (1920) LTD..*

# SIMPLEX

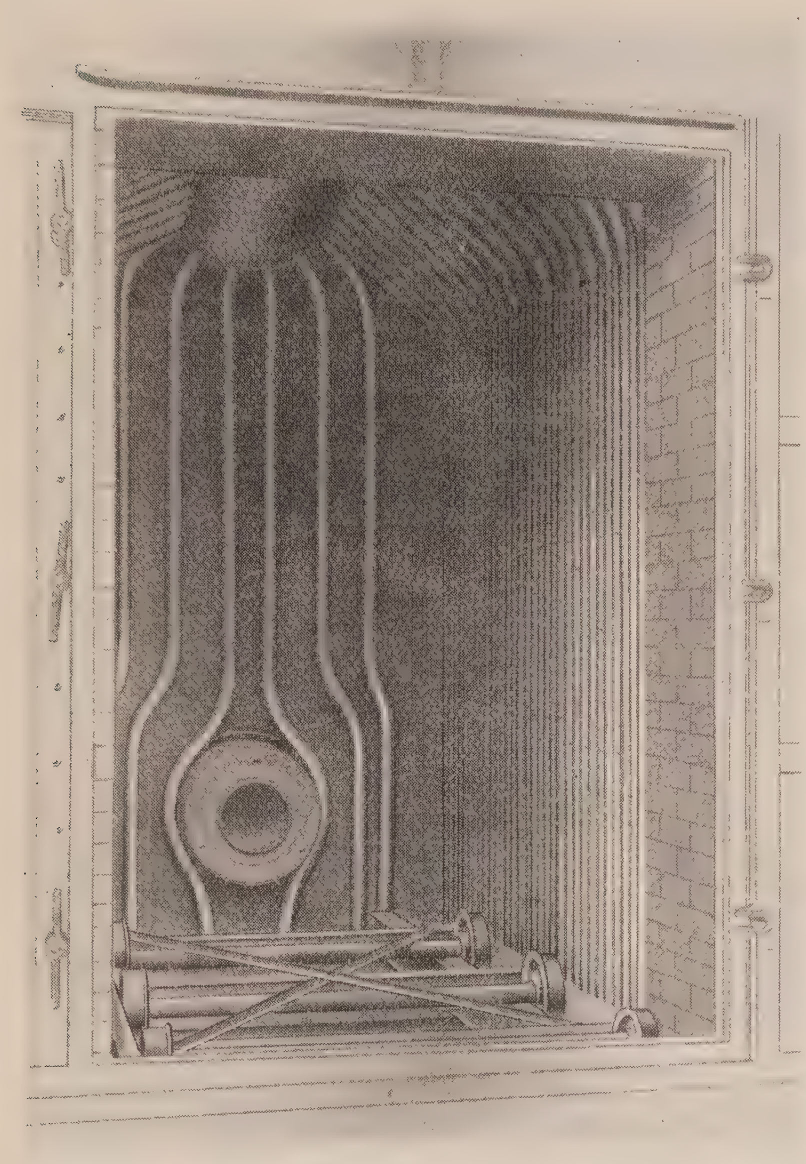
## EXTINGUISHERS

SODA, ACID, AND

FOAM TYPE

finest quality-
perfection in-
operation - -
fully approved
by all insurance
companies - - -

**MATHER & PLATT Ltd.**
PARK WORKS ~ MANCHESTER



INTERIOR OF SULZER DRY-COOLING CHAMBER SHOWING TUBES OF STEAM BOILER.

### The Gas Industry and Low Temperature Carbonization.

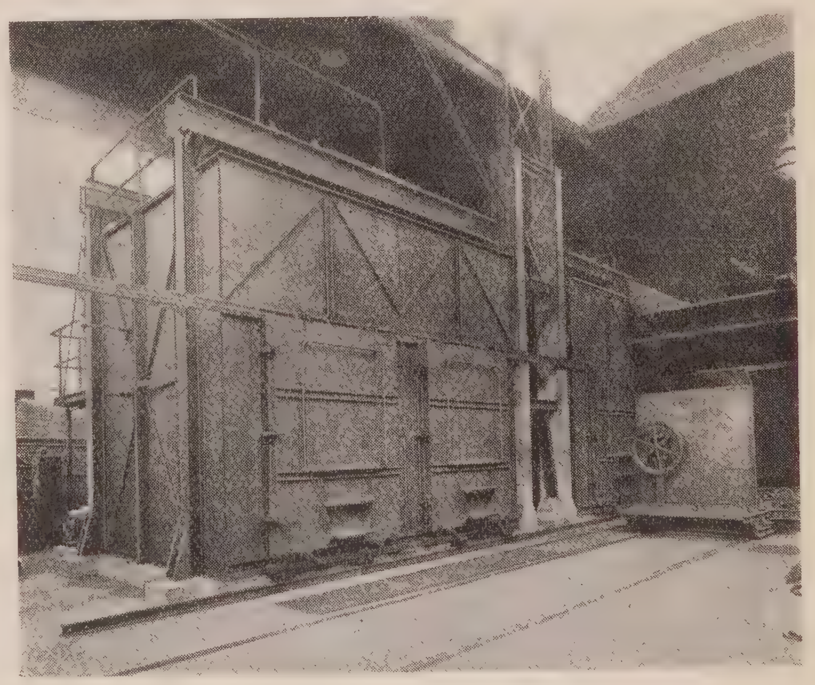
The attitude of the Gas Industry towards low temperature carbonization has in some quarters met with adverse criticism. While the Gas Industry is more favourably situated for taking up low temperature carbonization than any other industry it has appeared to be apathetic and apparently unwilling to recognise the advantages of low temperature systems. This view, however, is far from being correct as the Gas Industry has for a long time realised the importance of the production of a good smokeless fuel. It has been careful to satisfy itself, however, as to whether the proposals put forward gave promise of being sound commercial propositions. Several low temperature processes have been and are being tried out by Gas Undertakings and if found successful from the commercial point of view, as well as that of efficiency, they will no doubt be retained and extended. If however, equally good results can be obtained by high temperature carbonization with its greater yield of gas, there would appear to be little hope of Gas Undertakings adopting low temperature systems extensively in preference to high temperature carbonization. The Gas Industry is primarily concerned with the production of gas and any process which cuts down the quantity of gas produced, whether in cubic feet or therms, is naturally looked upon with disfavour unless there are compensating advantages. The special fuel and the liquid products produced must realise prices sufficiently high to make the process worth while. On the other hand the extended sale of the smokeless fuel produced must depend very largely on its price in relation to that of coal. The Gas Industry is in a favourable position to utilize all the gas made and has existing facilities for dealing with the by-products.

### High Temperature Carbonization.

The Gas Industry has already made a great contribution to the solution of the smoke problem by providing by means of High Temperature Carbonization, an excellent gaseous fuel for cooking and heating and a smokeless solid fuel, gas coke, which for many purposes is very satisfactory. Gas Fires are clean, convenient, efficient and quite as cheap to run as coal fires for intermittent use, but for continuous or all-day use the coal fire costs less. Since large numbers of people in this country have still a deeply-rooted affection for the open coal fire, it is necessary to provide at reasonable cost a smokeless fuel which will give the cheerful effect of coal without its attendant evils of smoke, filth and dust.

It has been proved beyond doubt that the Gas Industry can, if it will, produce such a fuel in the plant in common use for the manufacture of town gas. In this connection one must bear tribute to the good work done by Mr. John Roberts, a pioneer in the production of a freely buring fuel by carbonizing blends of caking and non-caking coals.

Mr. Roberts conducted experiments on a working scale at Ramsgate with Intermittent Vertical Retorts and produced a fuel named "Homite" which was very satisfactory when used in open fires. His process, however, was not carried out quite under the ordinary conditions generally obtaining in Gas Works. Mr. Roberts forsaw the possibilities however, and predicted that the kind of fuel required for the domestic grate could be produced by high temperature carbonization and by the ordinary methods generally in use on Gas Works. That prophecy has been fulfilled. The Liverpool Gas Company after carrying out research extending over many years has produced a new fuel made by high temperature carbonization known by the registered name of "DRYCO," which gives excellent results and can be sold at a price that can eaisly compete with that of house coal.



EXTERIOR VIEW OF SULZER DRY-COOLING CHAMBERS.

**Qualities Desirable in a Domestic Fuel.**

The qualities to be desired in a good domestic fuel for use in the open grate may be stated as follows :—

1. The fuel must be easily ignitable.

2. It must not take long to reach its maximum heat radiating power.

3. It must give a good heat radiation and must be capable of maintaining its heating power for as long a period as possible, giving a bright fire almost to the end.

4. It must be capable of burning away so that the unconsumed fuel left in the grate at the end shall be reduced to a minimum.

5. The ash left in the grate must be small in quantity and not of that light dusty kind which adheres to the surface of the fuel and is blown into the room, but must be the sort that will fall into the ashpan and cause a minimum of nuisance.

6. The fuel must be smokeless.

7. It must give a cheerful glow and some flame to impart a lively appearance to the fire.

8. It must be clean to handle.

9. It must be reasonable in price.

10. It must be sufficiently robust in structure to stand a reasonable amount of transport and handling.

It is claimed that “Dryco” possesses all these qualities when burnt in an open grate. This result has been been achieved after lengthy research and the surmounting of many difficulties.

The fuel is now being made on a commercial scale at the Eccles Street Works of the Liverpool Gas Company, where new blending and dry-cooling plant has been installed for the purpose. This Plant has been working continuously since January last.

**Summary of Research Work.**

A brief summary of the research work carried out resulting in the production of Dryco may be of interest. Much valuable work had already been done on the production of coke and smokeless fuel by the Fuel Research Board, the Leeds University and others. The research at Liverpool has been carried out from the practical standpoint of making use of ordinary methods, existing gas making plant and under local conditions. Investigations were carried out in at least four different directions, viz :—The selection and blending of suitable coals ; the study of temperature conditions ; methods of dry cooling ; and the question of sizing or grading.

The research involved both chemical and mechanical problems.

In conducting the investigations it was stipulated generally that :—

1. The coals used must be easily obtainable and that they should be used in the state in which they were received from the Colliery, that is without any additional washing, screening or grinding.

2. That carbonization must be carried out at high temperatures as generally used in Gas Works and without material reduction in the make of gas per ton.

3. The Fuel produced must be dry cooled and graded to the size most suitable for use in a domestic grate.

4. That the graded fuel must be capable of being easily ignited in the ordinary way with wood and paper.

5. That the ash content should be reasonably low and of the kind that would not adhere to the surface of the fuel but would fall into the ashpan.

A long series of experiemnts were made by Mr. H. H. Thomas, B.Sc., at Garston on the properties of various coals with a view to their suitability for blending, the effect of the size of the particles, the temperature and period of carbonization and tests of the solid residuals therefrom for ignitability, rate of burning, strength, etc.

By process of elimination, the coals and methods of treatment found most suitable for giving the required results under high temperature carbonization were selected for further experiments.

Some of the results of these are shown in Table I.

**TABLE I.**

TESTS OF FUEL
PRODUCED FROM BLENDS OF A CAKING COAL WITH A NON-CAKING COAL.

| | Caking Coal % | Non-Caking Coal % | Temp. of Carbonization | | Period of Carbonization Hours | Analysis of Fuel Produced | | | | Shatter Tests of Fuel | | | | | Gas required for ignition |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Combustion Chamber o C | Retort o C | | Moisture | Vol. Mat. | Carbon % | Ash % | As taken from Retorts | | | | | |
| | | | | | | | | | | On 2″ | 2″ on 1½″ | 1½″ on 1″ | 1″ on ½″ | Thro ½″ | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| A | 40 | 60 | .. | 1050 | 9.0 | 3.58 | 2.72 | 86.66 | 7.04 | 70.0 | 13.0 | 8.0 | 5.6 | 6.4 | 4 |
| B | 50 | 50 | .. | 1060 | 9.0 | 2.82 | 2.58 | 84.98 | 9.62 | 64.0 | 16.0 | 8.0 | 7.6 | 6.8 | 6 |
| C | 50 | 50 | .. | 1100 | 9.5 | 2.64 | 1.46 | 89.02 | 6.88 | 62.0 | 14.0 | 10.0 | 6.0 | 7.5 | 6 |
| D | 40 | 60 | .. | 1060 | 9.75 | 3.40 | 2.9 | 86.88 | 6.82 | 66.0 | 14.0 | 7.0 | 12.0 | 6.3 | 6 |
| E | 50 | 50 | 1380 | 930 | 10.0 | 1.48 | 1.12 | 90.28 | 7.12 | 64.0 | 18.0 | 8.0 | 6.4 | 5.0 | 20 |
| F | 60 | 40 | 1400 | 1070 | 10.0 | 1.48 | 1.92 | 89.64 | 6.96 | 58.0 | 17.0 | 11.0 | 5.9 | 8.0 | 20 |
| G | 66 | 34 | 1370 | 950 | 8.0 | 3.64 | 2.76 | 87.25 | 6.35 | 68.0 | 14.0 | 6.0 | 6.3 | 5.3 | 4 |
| H | 60 | 40 | .. | 1030 | 10.0 | 2.44 | 1.76 | 88.76 | 7.04 | 66.0 | 12.0 | 9.0 | 7.8 | 5.5 | 8 |
| J | 60 | 40 | .. | 1020 | 10.25 | 7.0 | 2.51 | 84.24 | 6.25 | 54.0 | 18.0 | 12.0 | 12.0 | 6.1 | 8 |

NO

SMOKE SOOT
DUST or ASHES

if you let HADENS instal MODERN SYSTEMS for

STEAM RAISING, CENTRAL HEATING,
HOT WATER SUPPLY, VENTILATION,
by
OIL-FIRED BOILERS
ELECTRIC THERMAL STORAGE

Extensive Experience. Many Installations.

G. N. **HADEN** & SONS LIMITED
*Estab.* 1816

*Heating, Ventilating and Electrical Engineers*

*Works and Head Office* TROWBRIDGE

*Also at* LONDON, MANCHESTER, BIRMINGHAM, GLASGOW, DUBLIN, LINCOLN, BRISTOL, BOURNEMOUTH, NEWCASTLE, TORQUAY, LIVERPOOL, EASTBOURNE

A TRIPLE ALLIANCE
AGAINST THE SMOKE EVIL

GAS

The Ideal Fuel. Saves time, labour and space, and gives the easiest of regulation and control, with reduced fire risk.

COKE

Smokeless and Sootless. Low in price. Graded in size. Easily handled and gives off intense heat. Coke nuts are specially useful for domestic coke boilers and closed stoves.

DRYCO

The New Fuel. Smokeless and Sootless. Lights with paper and chips. Gives a hot, brightly-glowing fire with some flame. At present can be supplied only within the area served by the company.

THE LIVERPOOL GAS COMPANY
DUKE STREET - - - LIVERPOOL
**Telephone : Royal 4100**

# Wipe out that smoke!

## "BENNIS" STOKERS

*ensure*

**ABSOLUTELY SMOKELESS COMBUSTION**

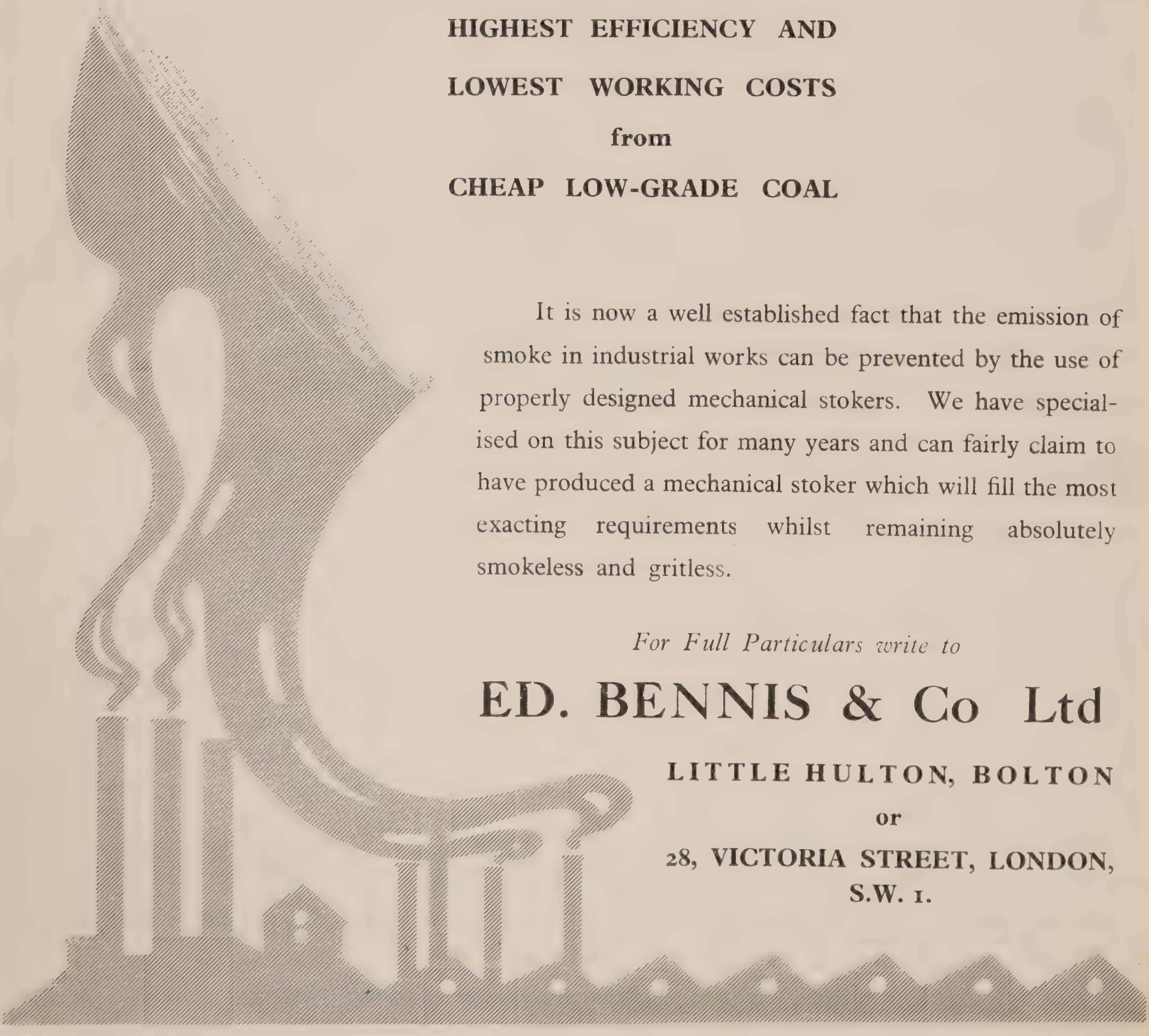
*combined with*

**HIGHEST EFFICIENCY AND**

**LOWEST WORKING COSTS**

**from**

**CHEAP LOW-GRADE COAL**



It is now a well established fact that the emission of smoke in industrial works can be prevented by the use of properly designed mechanical stokers. We have specialised on this subject for many years and can fairly claim to have produced a mechanical stoker which will fill the most exacting requirements whilst remaining absolutely smokeless and gritless.

*For Full Particulars write to*

**ED. BENNIS & Co Ltd**

LITTLE HULTON, BOLTON
or
28, VICTORIA STREET, LONDON,
S.W. 1.

A large number of different fuels made under the conditions that were found most suitable were tested in an open grate with apparatus for ascertaining the radiation, relative ignitability, etc. Each fuel to be tested was broken and graded through 2in. mesh and over 1in. mesh and 12lbs. of the fuel placed in the grate. For the purpose of testing the relative ease of ignition, a gas burner was used and the gas required to ignite the fuel was measured by meter. To ascertain the relative radiating power of the fuel and the time taken to reach the point of maximum radiation, galvanometer readings were taken every 15 minutes. The fire was replenished when the fuel was level with the top bar of the grate, enough fuel being added to restore the original level. Each test was run for six hours and during that time the grate was replenished twice. After the final readings had been taken the fuel was gathered in the middle of the grate and allowed to burn out. The ash and unburnt fuel were afterwards collected and weighed.

In this way much valuable information was obtained which may be summarized as follows :—

1. Relative ease of ignition.
2. Time taken to reach point of maximum radiation.
3. Radiation curve for the period of test.
4. Average radiation.
5. Power to pick up after replenishing.
6. Weight of ash and unburnt fuel left.

Tests were also made, using wood and paper for lighting.

It was found that if the fuel would ignite with 4 cu. ft. of gas, it could with certainty be lighted fairly easily with wood and paper. It was noticed that the fire reached its maximum radiation sooner when lighted with wood and paper than when gas was used and turned out after ignition had taken place.

The Shatter tests were helpful in showing the relative strength of the fuel to stand handling and transport.

Further tests were made to ascertain the most suitable grading or size of the fuel. One batch of the same fuel was graded to the following sizes :—2½in., 2in., 1½in., and ½in. There were remarkable differences in the behaviour of these grades of fuel especially as regards ignition. The 2½in. size refused to ignite with 20 cu. ft. of gas but lighted fairly easily when the bottom of the grate had first been covered with small fuel and then with the 2½in. fuel added. The radiation however was comparatively poor and it took a long time to reach the point of maximum radiation. In the case of the 2in. size ignition was obtained with 6 cu. ft. of gas, the maximum radiation was higher but was reached in a longer period of time. The 1½in. size required 4½ cu. ft. of gas for ignition and the 1in. and ½in. sizes only 4 cu. ft., the more densely packed fuel offering a greater surface to the gas flame. When the gas flame was turned out, however, the rate of combustion decreased. The best radiation figure was reached with the 2in. grade.

After careful study of the results it was decided that the new fuel should be graded to pass through 2in. mesh and all particles passing through ½in. mesh should be rejected.

It was found that the presence of moisture in the fuel greatly retarded ignition, while the presence of volatile matter, although not essential, assisted ignition.

Referring to Table I., it will be seen that the volatile matter present in the fuel was not a determining factor as regards its ignitability. For instance, in test " C " a 50/50 mixture was carbonized at 1100% C in 9½ hours and the volatile matter in the fuel was only 1.46% and yet it ignited with only 6 cu.ft. of gas, whereas a similar mixture in test " F " carbonized at a slightly lower temperature (1070% C) for 10 hours, produced fuel containing 1.92% volatile matter but required 20 cu. ft. of gas for ignition. The tests indicate that careful control of the heats and the period of carbonization are important factors, and this has proved to be so in practice on a larger scale.

All the fuels referred to in the Table gave good radiation results. The Shatter tests showed that all the fuels were reasonably strong and suitable for handling and transport even when as much as 60% of the non-caking coal was used.

**Blending.**

The finding of a satisfactory method of intimately mixing two or more coals on a working scale was not so simple a matter as it at first seemed, especially when the coals to be mixed were different in size and physical condition. It was realised that while pulverizing the coals before mixing would undoubtedly be an advantage, additional expense would be incurred which should be avoided if possible. It was of course necessary to provide some means of varying the proportions of the coals to be blended.

Several mechanical devices were considered and two methods were tried on a practical working scale. The first plant erected at Garston consisted of two hoppers arranged side by side with bottom openings leading into a trough containing two screw conveyors, one of them with a right hand thread and the other with a left hand thread, conveying the two coals to be mixed to a central discharge shoot leading to a gravity bucket elevator. By altering the gear ratio the relative speeds of the two screw conveyors could be varied and the proportions of the two different coals definitely fixed in any required ratio.

The other device and the one which is now in operation at the Eccles Street Works consists of two discs rotating in horizontal planes, one above the other, fitted with ploughs and adjustable feeding shoots. At each revolution of the discs definite quantities of the coals are swept into a common shoot fitted with deflecting plates for further assisting in mixing the two qualities. The quantity of coal passing from each disc can be regulated by raising or lowering the feeding shoot delivering the coal to the disc. Tests have proved that the coals are intimately mixed and the product uniform in quality. The latter method is less costly than the other and has never failed, whereas the first method described, while quite satisfactory when care is taken, has been known to fail due to the coal hanging up in one or other of the hoppers and so failing to feed one of the coals into the conveyor.

**Dry Cooling.**

The first plant installed by the Liverpool Gas Company on a working scale for cooling incandescent coke without contact with water was erected at the Linacre Gas Works in 1912. At that time it was realized that excessive moisture lowered the heating value of the coke considerably, while contact with water when the coke was in a highly heated state had a disintegrating effect, tending to form breeze. Briefly, the plant consisted of twin steel containers (the two compartments being fixed one above the other), approximately the same in section as the retort but half its length and closed at one end. The container, suspended from the travelling carriage of an overhead transporter, was placed before the retort in a horizontal position and the red hot coke was pushed into it. The container was then turned on its trunnions into a vertical positon, the upper end being automatcially closed by a heavy lid, and then transported to a series of cooling chambers, each container being lowerd into a separate cooling chamber. Water was then circulated by means of a pump around the container. At the end of an hour the coke was sufficiently cool to be discharge and the container was then withdrawn and discharged by tipping. This plant worked for some years but they heavy containers were found to be rather awkward to handle and the repairs were heavy.

When new Coal Gas Works were constructed at Garston in 1921 the opportunity was taken to instal another dry cooling plant in which the container and cooling chamber were combined.

The red hot coke was run into the chamber directly from a " G.N." Coke Handling Machine, the top door was then shut and water was circulated round the walls of the chamber as in the case of the original plant at Linacre. The Coke when sufficiently cool was discharged from the bottom door into a Telpher skip. (This plant was described and illustrated in the Author's paper read before the Institution of Gas Engineers in 1924.).

The plant at Garston was in continuous use from 1922, except during repairs, up to a short time ago.

When it was decided to adapt the Eccles Street Gas Works for the production of " DRYCO " the question of dry-cooling had to be further considered. Messrs. Sulzer Bros. of Winterthur had brought out a new method of cooling which at the same time made use of the heat from the incandescent coke to generate steam. Plants on this system were erected at Burnley and at Glasgow.

The essential features of these plants were :—
A large firebrick-lined container ;
A hoist for lifting the red hot coke into it ;
A water tube boiler, and
A fan with connections to the container and the boiler.

The plant was operated as follows :—

The red hot coke having been deposited in the container and the door closed inert gases formed inside the container were drawn by means of the fan through the boiler and re-circulated over and over again until the heat from the coke had been transferred to the water in the boiler for the production of steam. After inspection of the plants at Burnley and Glasgow and also other installations on the Continent embodying further improvements it was decided to instal at the Eccles Street Works an improved form of Sulzer Cooling Plant in which the separate cooling chamber and the hot coke hoist were eliminated. In this system the red hot fuel is placed in a large container which is then run on rollers into the interior of a water tube boiler provided with a tightly fitting door. Inert gases are circulated by a fan through the red hot fuel and around the water tubes of the boiler until at the end of eighty minutes the fuel is sufficiently cool to be taken out. At the end of the period the fan is stopped, the door is opened, the container drawn out of the chamber and another container filled with incandescent fuel is inserted. The plant will produce nearly 1,000lbs. of steam per ton of fuel cooled. The steam is used for generating power on the works. The container full of cooled Dryco is hoisted, transported and tipped into the hopper of the breaking and screening plant.

**Preparation of Dryco for Distribution.**

After the "Dryco" has been cooled in a Sulzer Coke Cooling Plant, it is broken down to 2in. size by means of a " Nelson " Breaker, in which the breaking elements are in the form of pricker rings made of Manganese steel. It is then passed over a " Roisin " Screen which eliminates all the fines ½in. and under. The Roisin Screen consists of a series of rollers with equal spaces between, corresponding to the size or grade of the breeze to be separated. Most of the rollers have coarse threads on their surfaces but, after every four rollers is placed a plain roller, the four succeeding rollers having threads of a different hand. This arrangement gives the peculiar motion to the fuel which is the special feature of the system, since in addition to each piece being continually and gently turned over it is also moved from side to side. The roller shafts work in self aligning pedestals with " Tecalemit " lubricators. After passing over the Roisin Screen the "Dryco" is passed into a storage hopper from which it is drawn as required for bagging. In order to properly grade the fuel and take out any further fine breeze which may have been formed in passing through the hoppers, the "Dryco" is drawn from the Storage Hopper into an " Excelsior " Screen, from which the bags are filled. Each bag is marked in large letters with the name " DRYCO " and is weighed to contain 1 cwt. After being sealed the bags are placed on lorries for immediate delivery (Fig. 20).

**Comparision with Other Fuels.**

In Table II. Dryco is compared with a good domestic coal, a well known low temperature fuel and a vertical gas coke.

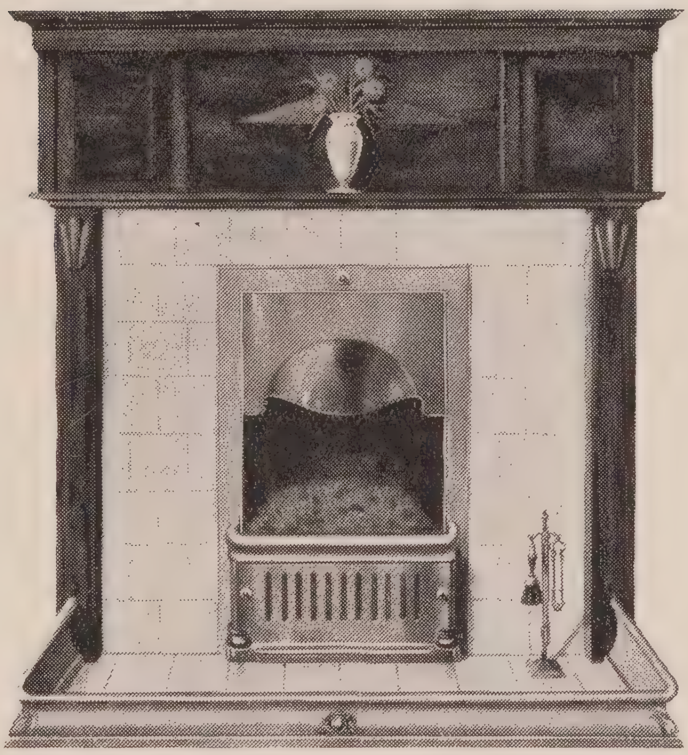
TABLE II.

| 1 | 2 Gas Required to Light | 3 Maximum Radiation during first 2 hours | 4 Time Taken to reach Maximum Radiation | 5 Average Radiation over whole period of Test | 6 Ash and Fuel remaining after fire had gone out |
|---|---|---|---|---|---|
| | C. ft. | Galvanometer Reading | Minutes | Galvanometer Reading | % |
| " Dryco " .. .. | 4 | 105·0 | 75 | 93·5 | 10·2 |
| Low Temperature Fuel | 3 | 82·6 | 75 | 81·1 | 9·9 |
| Coal .. .. .. | 2 | 63·6 | 120 | 66·1 | 11·7 |
| Vertical Coke .. .. | 6 | 87·0 | 120 | 62·0 | 12·1 |

# 'SANTORE'

# the new Coke Fire

*Economy of Fuel*
*Bright open fire*
*Smokeless*
*Sliding Canopy*
*Ventilating Front*



*Perfect Control of Fire from dull red to bright white*
*Adapted for Hot Water Supply if required.*

Stout Cast Iron Interior, Cast Iron Fire Bars, Damper and frame fitted Wrot Iron Rod and Knob. Refractory Fire brick back and bottom.

*Write for details and modes of Fittings to the makers ........................................................................*

**NEWTON CHAMBERS & Co., LTD.**

**MOORHEAD,**
**SHEFFIELD,** Eng.

*Tel. Add.: "ENSEE," SHEFFIELD.*
*Tel. No. 20351 (2 Lines).*

M
B

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COAL
NATURE HAS HERSELF PROVIDED

# ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—
**DOMESTIC HOT WATER BOILERS**
**CENTRAL HEATING**
**OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING**

*ENQUIRIES AND DESCRIPTIVE LEAFLETS :—*

**AMALGAMATED ANTHRACITE COLLIERIES LTD.**
120, FENCHURCH STREET,
LONDON, E.C. 3.

It will be seen that Dryco gave the highest degree of radiation (105) in the first period and reached that point in 75 minutes, whereas the low temperature fuel only reached 82.6 in the same period of time, the other fuels being much inferior both from the point of view of maximum radiation and the time taken to reach that maximum. The coal fire gave off luminous flames but was black at the top and a much lower maximum radiation (63.6) was reached than in the case of the other three fuels. The Dryco and the low temperature fuel after replenishing, in the second period reached maxima of 114.6 and 113 in 45 minutes and 60 minutes respectively, while the coal reached 86.3 in the second period. (Fig. 21).

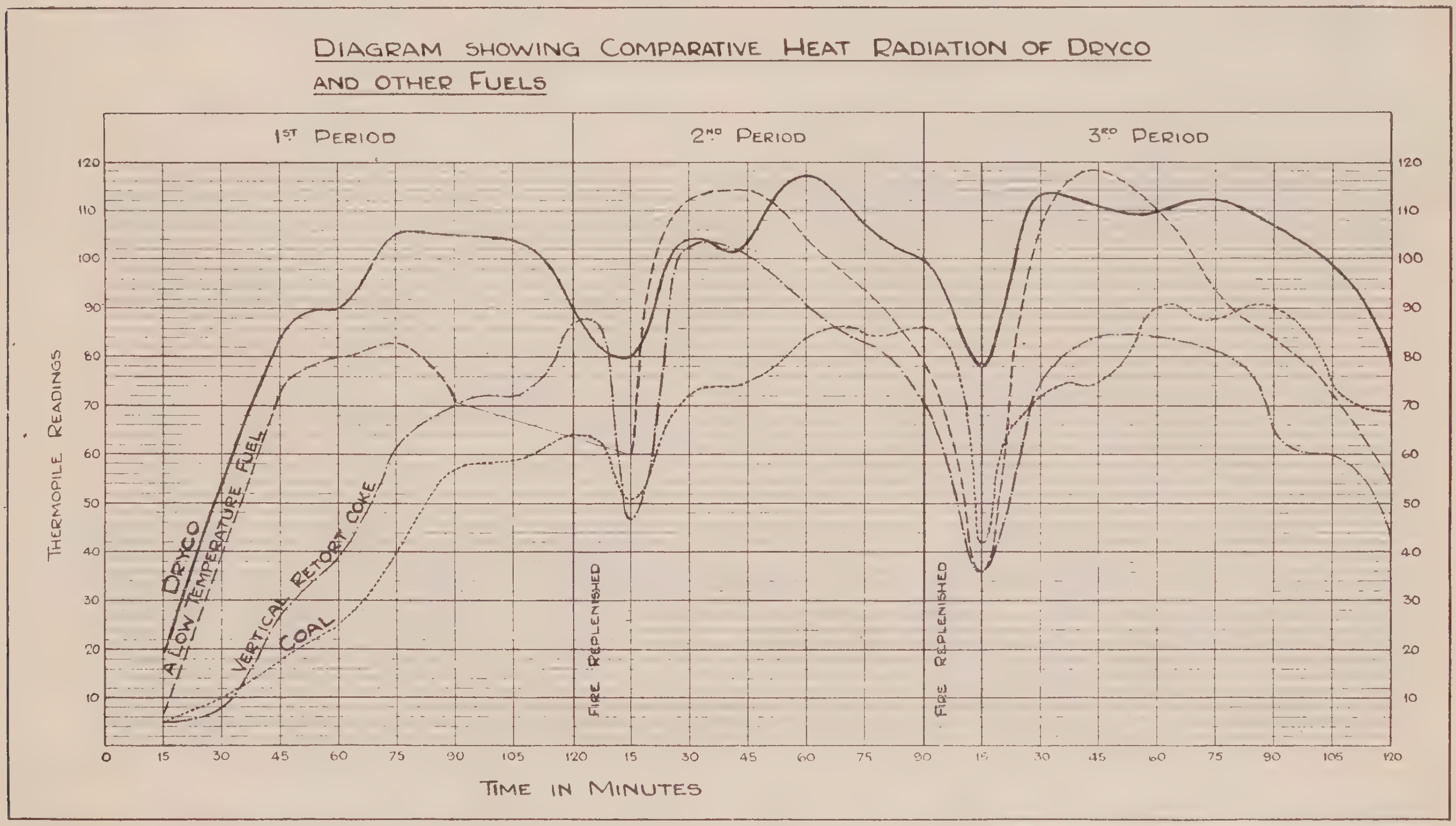
In column 5 the average readings for radiation for the whole period of the test, taken every 15 minutes, showed that Dryco was superior to the low temperature fuel and much better than the coal and the vertical coke. The percentage of ash and fuel remaining in the grate after the fire had been allowed to go out did not show much difference. The best figure was 9.9% in the case of the low temperature fuel, Dryco being only slightly more (10.2%). The Dryco containing 2% of volatile matter, was entirely smokeless but the low temperature fuel, containing 11.7% volatile matter, gave off a little smoke when it was lighted and also when it was replenished. As was to be expected the low temperature fuel ignited more readily than Dryco but it was found that when only 4 cu. ft. of gas was required for ignition, Dryco would readily ignite with paper and wood, a good fire being obtained in a shorter time than when gas was used. A typical test of the Dryco now being made is given in Table III.

TABLE III.

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| Gas to Light Fire | Time Taken to reach Maximum Radiation 1st Period (2 hours) | Maximum Radiation during 1st Period (2 hours) | Maximum Radiation in whole of Test Period | Average Radiation over whole period of test | Ash and Fuel remaining after fire had gone out |
| C. Ft. | Minutes | Galvanometer Reading | Galvanomoter Reading | Galvanometer Reading | P. Ct. |
| 3 | 80 | 95 | 120* | 89.4 | 10.7 |

*Pointer went beyond the Scale of the Galvanometer.

After the first replenishment the fire reached a radiation figure of 92 in 15 minutes and 108 in 30 minutes. It may be claimed that these results are extraordinarily good and especially when it is noted that the fuel contained only about 2% of volatile matter.



| AVERAGE OF THERMOPILE READINGS |
|---|
| DRYCO 94·05 ; COAL 60·50 |

### Dryco, in Use, Its Advantages.

Large numbers of users of Dryco have expressed appreciation of its good qualities and have continued to use it in place of raw coal. They have found that it lasts longer, weight for weight, although the fire may require feeding at rather more frequent intervals. It is graded to a fairly uniform size, is clean to handle, and produces a hot fire of much greater heating power than coal. Dryco can be lighted with paper and wood in the ordinary way and within a quarter of an hour a good body of hot fuel can be obtained. It has a cheerful appearance due to the brightly glowing fuel and the short flickering flames appearng on the surface.

Another important feature is that the fire may be allowed to get low and will pick up again quickly when replenished. The fire remains bright almost to the end if allowed to die down and the amount of ash left is small in quantity and is not of that light powdery nature that will adhere to the fuel or fly about the room but will fall into the ashpan and cause a minimum of nuisance. The fuel is absolutely smokeless, it is cheaper than coal, but will last longer for it is twice the bulk of coal, being much lighter per cubic foot. It contains no moisture and the sulphur content is much less than in coal. The fuel being sootless, chimney sweeping and flue cleaning are eliminated and the atmosphere is kept clear so that the full effect of the sun's rays may be enjoyed.

" Dryco " and Coal of equal weights.

Dryco has been found very satisfactory not only in open grates of various kinds but also in kitchen ranges, slow combustion stoves and hot water boilers. During the past nine months a grate has been in constant use at the Showrooms of the Liverpool Gas Company for demonstrating the burning of Dryco. The fire has attracted the attention of large numbers of people. Hundreds of orders has been obtained from those who have seen it in operation. The grate of this fire slopes downwards towards the back and is particularly suitable for this class of fuel. Dryco will, however, burn well in any type of grate. (Figs. 24, 25 and 26).

As Dryco is smokeless some people have erroneously thought that it might be used in a fireplace where coal could not be used on account of down draught. This is of course is an entirely mistaken idea as in both cases the products of combustion would go into the room instead of up the chimney.

The best way of lighting a Dryco fire with paper and wood is as follows :—

Paper is placed in the bottom of the grate, and three or four pieces of wood kindling are laid on this, parallel with the bars or front of the grate. On this about the same number of pieces of wood are placed at right angles to the first layer. The wood is then covered with a small quantity of Dryco and this is followed by another layer of wood. The paper is ignited and, when the wood is burning, the grate is filled with Dryco.

The same result can be obtained using newspapers only.

A double sheet of newspaper is folded into four, twisted lightly into a large spill, and tied into a single knot. Using knots of paper in place of wood kindling, and following the same procedure as for wood, the Dryco ignites just as readily.

The latest method, however, of lighting a fire is by means of a gas burner fitted in the grate for this special purpose or by a gas poker attached to a position on the wall by means of a flexible tube. In this way any fire, whether it be coal, Dryco or other fuel, can be lighted with the minimum of trouble. Dryco should be stored in a dry place as the presence of moisture impairs its ignitability.

### Cost of Dryco.

The cost of producing Dryco is naturally more than that of making ordinary gas coke. In the first place specially selected coals of suitable quality have to be purchased and thoroughly mixed by a blending plant. During carbonization special care is necessary in regulating the temperatures and in fixing the period of carbonization. In maintaining the most suitable conditions the make of gas is rather less than under ordinary circumstances. There is further expense due to the breaking and grading of the fuel.

As the Eccles Street Works have not yet been entirely turned over to the manufacture of Dryco, it has not been possible to arrive definitely at its final cost of production, but from an estimate based on the actual experience so far gained it has been found that the cost per ton of fuel is approximately 7/6 more than the price of gas coke.

The cost of Dryco delivered in bags is made up as follows :—

| | |
|---|---|
| Yard price of Gas Coke .. | 25/- |
| Additional cost of Dryco .. | 7/6 |
| Cost of bagging and cartage | 6/8 |
| Price delivered within 3 miles | 39/2 |

Dryco can therefore be sold at a price below that of the best house coal and, in view of its higher radiating efficiency, its smokeless properties and other advantages, is already in good demand, a demand which will increase as its advantages become known.

In most homes the cost of fuel is an important item, but the householder generally speaking has only a hazy idea of the relative costs of the various fuels. It is not easy for him to obtain definite information as there are several variable factors.

In Table IV. an attempt is made to give relative costs in the form of the amount of heat obtainable for 1d. assuming certain prices and efficiencies of use.

# *The* ADVANCE GUARD *of* HEALTH *and* HAPPINESS!

ELECTRICITY—has banished thousands of air-polluting factory chimneys, and to-day in many districts is rapidly reducing the volumes of domestic smoke.

Interesting leaflets on the application of ELECTRICITY to modern uses will be forwarded post free, on request

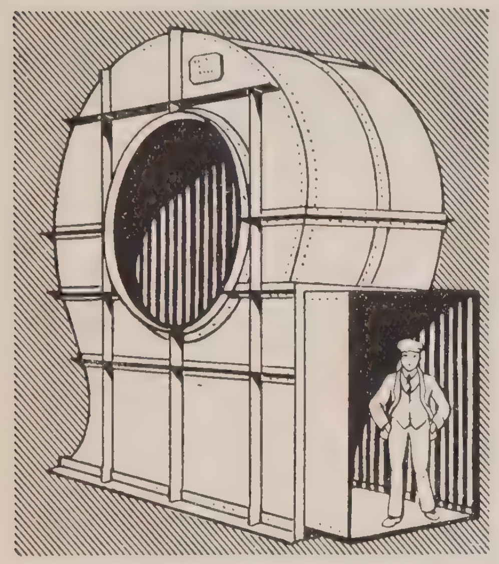
*to*

**THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.,**
**15, SAVOY STREET——STRAND, LONDON, W.C.2.**

---

**ELECTRICITY IS THE ENEMY OF SMOKE**

INCREASE YOUR BOILER EFFICIENCY...



The "Cyclone" System of Induced Draught effects a definite saving in Fuel Costs. It spells a double efficiency - a substantial increase of steam power - and the elimination of black smoke.

The low initial cost of installation is an incentive to take advantage of this application to Boiler efficiency of the latest scientific principals. You will find this claim substantiated by the facts set forth in Brochure 66F. Please write for a copy.

- *Write for Brochure 66F.*

**MATTHEWS & YATES LTD**
**SWINTON MANCHESTER**
*London Office :* 20, *Bedford Row, W.C.* 2.

---

WHY NOT HEAT WITH OIL FUEL THIS WINTER?

IF you are considering installing central heating or are dissatisfied with your present system you certainly must investigate the Parwinac Automatic Oil Burner Heater.

Coupled to any heating system, it absolutely revolutionizes it. The temperature is controlled **automatically** at a beautiful "evenness." No stoking, no odours, no dirt, burns cheapest oil. Switches on and will raise temperature from zero to 55 degrees in one hour.

***Write to-day for illustrated Brochure OB post free.***
PARKER, WINDER & ACHURCH, LTD.
Heating Engineers, BIRMINGHAM.
*London, Manchester, Leicester.*

O.B.X.

Parwinac AUTOMATIC OIL BURNING HEATER

---

ECONOMISE FUEL

BY USING THE

SEOTOO
FLUE GAS
CARBURETTOR
In Your
BOILER FURNACES

SEND ALL PROBLEMS
RELATING TO COMBUSTION
TO

**Smoke Prevention Limited**
1 Victoria St., London. S.W. 1

The comparison is really unfair to the solid fuels, as their radiation efficiences only have been taken. In the case of gas, the efficiency of 75% is made up of 50% radiation and 25% convection, the other 25% entering the flue and performing the useful function of ventilating the room.

Electricity is created with 100% efficiency, which can only be obtained in a sealed room without any ventilation whatever, Such a room would of course be unhealthy to live in.

TABLE IV.

| Description of Fuel | Price | Efficiency of Use | Effective Heat Units for 1d. |
|---|---|---|---|
| Dryco .. | 39/2 per ton .. | 30% | 18,387 |
| Coal .. | 45/- per ton .. | 20% | 10,785 |
| Gas .. | 7.4d. per therm | 75% | 9,121 |
| Electricity | 1d. per unit .. | 100% | 3,412 |

## Conclusion.

It has been clearly demonstrated that a good smokeless solid fuel can be produced on a working scale by High Temperature Carbonization at reasonable cost, without interfering unduly with the Gas Making Process as usually carried on by most Gas Undertakings. If proper care is taken in manufacture, the fuel produced will burn well in any ordinary open grate and will fully satisfy the need for a good smokeless fuel. In conclusion the author wishes to express his thanks to members of the Liverpool Gas Company's Chemical Staff, Messrs. H. P. Lupton, H. H. Thomas, and J. J. Brown for the assistance they have given in the preparation of this paper and to Mr. H. Nicoll for the help he has rendered with the illustrations. He has also to acknowledge his indebtedness to the Directors of the Company for allowing him to present this paper.

## Use of Raw Coal—A Penal Offence.

" The use of raw coal has been a penal offence in the past even in this country, and in some countries abroad is still a penal offence. The time may come when it will again be an offence here, although it is more desirable that the elimination of the smoke nuisance should be brought about by voluntary effort. But however that may be, I am firmly convinced that, perhaps within the lifetime of some of us present, the state of affairs which now exists will be looked upon as a reproach and as an illustration of the backwardness of the country during the present era."—Dr. C. H. Lander.

## Smoke and Snow.

Apropos of the report on Smoke Abatement, which stated that visibility may be effected by smoke from industrial areas 350 miles away, a climbing correspondent says that this may explain a phenomenon which has struck most mountaineers—the dirty appearance of drifts which have lain long amongst the heights. Around their shrinking edge, he says, there gathers a fringe of grime, for the presence of which all sorts of arguments have been put forward. It seems now that even in the remote Highlands the snow may be smirched by Glasgow's slums !—*Glasgow Bulletin.*

NATIONAL
SMOKE ABATEMENT SOCIETY

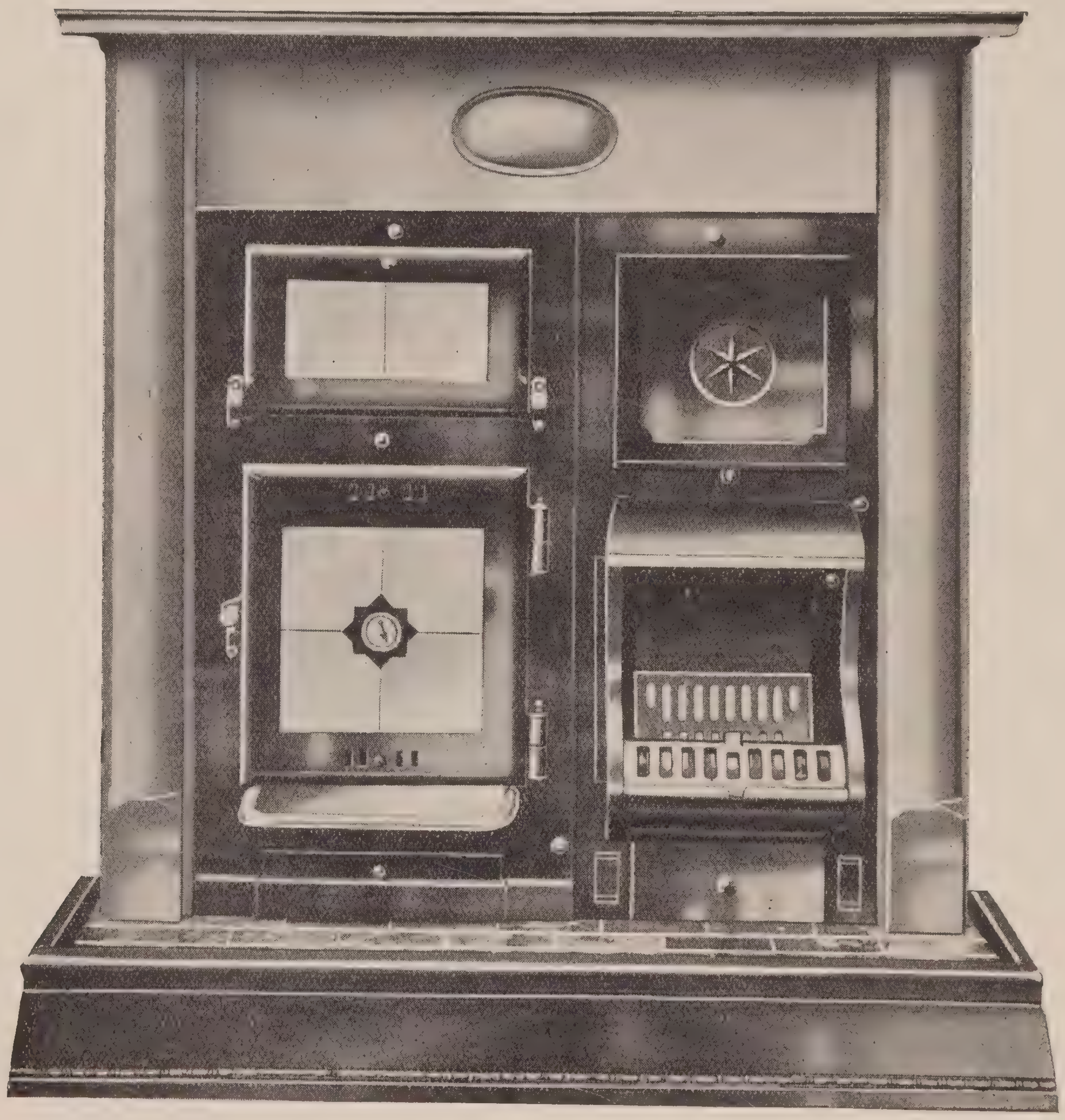
FILL UP THE FORM YOU WILL FIND IN THIS ISSUE **NOW** AND BECOME A MEMBER OF THE SOCIETY AND A REGULAR RECIPIENT OF THIS JOURNAL.—THERE'S NO TIME LIKE THE PRESENT !

## SMOKE ABATEMENT—HEAT WITHOUT SMOKE

PRO. PAT. 7574.  PATENT APPLIED FOR.

# "Southern Star" Domestic Cooker

TYPE "B"



### DETAILS OF TESTS.

Fuel—Coal, Coke, Coalite or other By-product Fuels.
Fuel Consumption—Under 4lbs. per hour.
ASH 4% of Fuel burned.
SOOT 3ozs. per week.
**HOT WATER.** Plentiful supply all day without using boiler damper. Baths 2 per hour, using boiler damper.
**OVEN.** Top and Bottom Heat.
Boiling—Pans **do** boil in Hot Closets.
Refuse—Household rubbish can be burned in this Stove.

### SOUTHERN STAR. TYPE "B."

Size $38 \times 38 \times 18$in. deep.
Flues, Self Contained, save installation costs and ensure satisfactory operation.

**"Top and Bottom Heat" one Control.**

Oven, $17 \times 15\frac{3}{4} \times 15$
Grill, $15 \times 4 \times 15$.
Hot Closet, $11 \times 14\frac{1}{2} \times 15$
Hot Closet, $21 \times 14\frac{1}{2} \times 8$
Open and Closed Fire.

Particulars and Prices will be gladly submitted.

*MADE BY . . .*

## W. H. MICKLETHWAIT & Co., Ltd.,

Clough Works, Rotherham.

## ATMOSPHERIC POLLUTION AND THE DOMESTIC FIRE.
### A NEW FIRE.

It is being gradually realised that the major portion of the smoke fog, and dirt, is not being caused altogether by the factory chimney but by the huge number of inefficient domestic fires.

The coal fire which can reduce the period of smoke emission and turn waste into heat will be a blessing to humanity, and will achieve the following advantages.

Save fuel, and thus conserve the fuel supply clear and brighten the atmosphere. Cooking and heating will be accomplished at less cost.

Undoubtedly the Domestic cooking range is the most important item of equipment in any homestead, but to meet the needs of the present day up-to-date and discerning housewife it must be efficient.

This problem has been thoroughly investigated by a Sheffield engineer and after exhaustive tests a series of Stoves have been manufactured by Messrs. W. H. Micklethwait & Co., Ltd., of Rotherham.

This Stove is known as "THE SOUTHERN STAR," and is the outcome of tests and experiments which have been carried out over a long period to reduce the smoke and ensure efficient combustion. Both results have been fully achieved in a remarkable and interesting manner.

Time tests carried out in conjunction with a Ringlemann Smoke Chart show that the smoking period of the new equipment is from 60 to 75 per cent. less than that from an ordinary coal-fired grate and the actual density of the smoke during the short period of emission is considerably less.

From the standpoint of pollution of the atmosphere the grate is a distinct advance upon any equipment on the market and the excellent results achieved are obtained by the ingenious admission of naturally and pre-heated air, which is provided by a simple air pre-heater incorporated within the combustion zone of the firebox. This device is quite automatic and self acting, but it reduces the smoke nuisance and ensures the liberation of more heat from the fuel being used.

This fire has the great advantage of efficiently burning inferior grades of coal and by-product fuels.

Several local authorities have investigated the claims made for this fire and an independent test made by the Sheffield Corporation (on a Model "A"), who have installed several, has revealed the following facts :—

Coal Saving per week—Stoves working 112 hours, 1¾cwts.
Soot deposit in flues per month—9 to 12ozs. ; soot removal only necessary once per month.
Hot Water plentiful, expeditiously.

The Model "B" illustrated will work efficiently six months without any necessity for flue sweeping.

An analysis of the ashy deposit taken from the flues of the "A" stove showed that the organic matter (Carbon) was only 16.91%.

The principle evolved has been incorporated into various units, notably Hospital Ward Heaters ; Shop Heating Stoves ; Large Installation Cookers and Heaters ; Domestic Cookers, incorporating Central Heating Boilers.

To show the high efficiency of these fires a large installation in Yorkshire has a double oven cooker for 250 persons using only 12lbs. of coal per hour and providing 30 gallons of **boiling** water per hour continuously.

To meet the objection of the semi-closed fire the principle has been incorporated into combination grates and interiors and these fires effect 30% saving in time to heat the oven, and a considerable reduction in smoke density, also less fuel is required.

The small amount of ash from these fires is attracting the attention of sanitary authorities who have to consider long rubbish hauls from housing schemes to destructor.

THE JOURNAL OF THE NATIONAL SMOKE ABATEMENT SOCIETY

is undoubtedly the ideal medium in which to advertise Smokeless Fuels and every appliance or device for minimising or abolishing the smoke nuisance. The advertisement rate is very moderate, while advertisers are assured of **every copy** of the Journal reaching the people who are working for this great modern reform. Smoke Abatement is not a theory ; it is not merely hygienic propaganda. **It is a step forward in the life of the nation.** The movement is making wonderful progress ; it is overcoming all old-fashioned prejudices. Its advance is irresistible. Every engineering firm which produces smoke-abating appliances, and every maker of smokeless fuels, should openly associate themselves with this great national reform, by advertising their products in the **only** National Journal devoted to Smoke Abatement.

Enquiries as to advertisement space should be addressed to the publishers :

THE SERVICE GUILD
**45, Deansgate Arcade, MANCHESTER.**

*Telephone:* BLACKFRIARS **9374.**

HODGKINSON'S PATENT AUTOMATIC STOKERS

Are guaranteed to prevent the emission of Smoke and Grits from Industrial Chimneys with the highest Economy and Efficiency and without the use of forced blast Steam Jets.

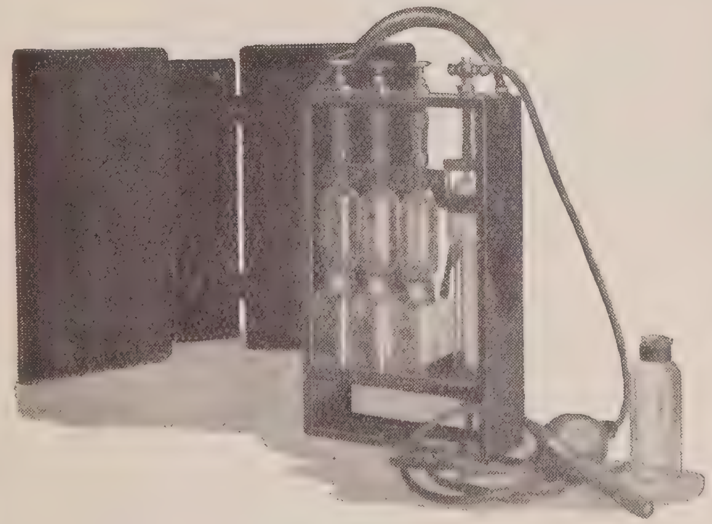
**JAMES HODGKINSON (SALF'D) LTD.**

FORD LANE WORKS,
PENDLETON - MANCHESTER

Telephone :
1491,2,3 Pendleton.

Telegrams :
"Incendo, Manchester."

CO2 TESTS AT THE RATE OF ONE PER MINUTE ! !



HAYS PORTABLE GAS ANALYSER.

The above analyser is still the most suitable instrument for making rapid, accurate, tests of the CO2 percentage in flue gases. Also deals with Oxygen and Carbon Monoxide.

*Full particulars from the makers*

**DUGUIDS LTD., LYMM, Cheshire**

The Service Guild

invites inquiries from any Society or Association desiring to publish a Handbook or Year Book without expense. The Guild undertakes such publications, (in cases where there is scope for obtaining advertisements) relieving its clients of all financial responsibility; producing and supplying the books entirely free of charge.

*Full Particulars from*

**A. E. SMITH,**
**The Service Guild,**
**45, Deansgate Arcade,**
**MANCHESTER.**

Telephone: Blackfriars 9374

# CLEANER CITIES

POWELL DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use :—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Lorries, etc.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are eminently suitable for use in modern mechanical stokers.

# BRIGHTER HOMES

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no soot, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes for various requirements :—

No. 1. Cobbles, for horticultural use and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, etc.

*For further particulars apply to :—*

## STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED

**4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3.**

And at :—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull,
Newcastle-on-Tyne, Glasgow, Belfast.

BURN CHEAP COAL
WITH AUTOMATIC CONTROL
**SMOKELESSLY, EFFICIENTLY, ECONOMICALLY**
FOR
CENTRAL HEATING
IN THE
PRIOR MASTOKER

*Ask for descriptive Leaflet from*

**SAUNDERS & TAYLOR LTD.**
Praed Road, Trafford Park, MANCHESTER.
**Telephone Trafford Park 2007** (3 lines)

**OIL OR COAL?**
ACCORDING TO CIRCUMSTANCES EACH HAS ADVANTAGES
EACH CAN BE SMOKELESS IF PROPERLY BURNT

THE
"PRIOR"
OIL FIRING SYSTEM
THE SIMPLEST **OIL** BURNER IN THE WORLD

**Some of its Advantages:**
- Low Air Pressure
- Gravity Feed for Oil
- No Small Jets
- No Moving Parts in Burner
- Soft Enveloping Flame
- Flame Regulation Range 8 to 1
- Thermostatic Control optional

*Let us send Particulars.*

THE
PRIOR
MASTOKER
A FULLY AUTOMATIC
UNDERFEED COAL STOKER
**FOR HEATING and DOMESTIC BOILERS**
*which effects*
A GUARANTEED SAVING of **25%** to **50%** as compared with hand stoking
Under Complete Thermostatic Control
Absolutely Reliable
**We invite you to see it working**

THE PRIOR OIL BURNER LTD.,
5 CROWN YARD, STANHOPE ST., LONDON, N.W.1.

CARDIFF AGENTS—
HAMPTON'S HEATING CO., LTD.,
18 CITY ROAD, CARDIFF.

MASTOKER AGENTS FOR MANCHESTER—
SAUNDERS & TAYLOR, LTD.,
PRAED ROAD, TRAFFORD PARK

# The Journal of the National Smoke Abatement Society

*Editor :* **Arnold Marsh, M.Sc.Tech.**

*Editorial Office:*
**23, King Street**
**Manchester**
**Telephone : Blackfriars 0896.**

*Advertisement Office:*
**The Service Guild**
**45, Deansgate Arcade, Manchester**
**Telephone : Blackfriars 9374**

Vol. 3. No. 10. 1932.

CONTENTS OF SPRING ISSUE

| | Page |
|---|---|
| Black Manna and Sun-thirst | 131 |
| Is Air Pollution Decreasing ? | 133 |
| Notes and News | 138 |
| An Effective Argument | 141 |
| Correspondence—Mr. James Law | 141 |
| Smoke Abatement, paper by V. R. Chadwick | 145 |

*The Journal is open for the free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotation and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgments are made.*

# Black Manna and Sun-thirst.

SPRING has a special significance to those who live beneath the black canopies of smoke. Except during coal stoppages the smoke fiend never hibernates; but his season of greatest activity and destruction is always in winter. Then is his greatest enemy, the sun, at his weakest; and his allies cold and fog most strong. With the coming of spring smoke by no means disappears, but to some degree at least becomes less intolerable. Let us take the opportunity of recording one incident of the winter offensive—appropriate word !—of 1930-31.

In December, 1930, the world was startled to hear of the tragedy of the Meuse Valley, when sixty people were killed as the result of the concentration of poisonous fumes during a period of abnormally dense fog. The English press featured this news as an unprecedented sensation, quite ignorant of the fact that there are parallel cases, similar in effect if not in such dramatic circumstances, in this country nearly every winter. No one would belittle the horror of the Belgian case, but surely a little more attention could be paid to our own more frequent massacres ? We can quote, for instance, the figures for a northern, city Salford, which may be cited, not as being abnormal, but as being typical of any large industrial district during a period of heavy smoke fog.

In December, 1930, there was little or no fog in this country, and the deaths from respiratory diseases in the city numbered 43. During the following month, January, 1931, there were nine days of almost continuous fog, and the deaths due to respiratory disease rose to 227 : an increase attributable to both the natural climatic conditions and the heavy concentration of soot, tar, and acids in the motionless air.

That the tragic consequences of this lethal fog are due very largely to coal smoke constituents is shown by the havoc to vegetation occasioned at the same time. In reply to a letter asking for more details than were contained in the Report of the Salford Museums, Libraries, and Parks Committee for 1930-31, Mr. J. Richardson, Superintendent to the Parks and Open Spaces Department, kindly supplied the following valuable information.

" I may say that this fog was the most poisonous I have ever experienced, although I have lived for many years in industrial towns. A large number of plants growing in the glasshouses at Buile Hill Park were severely damaged by the fog, and many were killed outright. The leaves of Cinerarias were shrivelled up as though they had been scorched, and many plants of Schizanthus, Clarkias, and other annuals were killed or so badly injured that they had to be thrown out. The foliage of bulbous plants, such as Tritonias, Freesias, etc., was damaged. In one case where a number of plants were standing on a ledge in a span-roof pit, the fumes penetrated through the chinks between the lights and sash bars, and wherever the leaves had been touched they were scorched as though acid had been poured over them. Other parts of the leaves were not affected at all. Numerous other plants suffered damage to some extent.

" I may say that all the glasshouses at Buile Hill Park are modern—as a matter of fact most of them were built in 1929 and 1930, and although the ventilators were kept closed and the houses are well heated by means of hot water pipes, the fog was so penetrating that much damage was caused. During the time the fog was on, the atmosphere in the houses was kept as dry as possible."

In view of these statements it is not difficult to realize the disastrous effects that must occur in the delicate membranes and tissues of the throat and lung.

The deaths in Manchester from respiratory diseases in January, 1931, were 365, compared with 94 the previous November. During the actual week of fog 130 people died from respiratory diseases, compared with the weekly average throughout the year of 20. Similarly it is estimated that under natural atmospheric conditions £80 would suffice dead plants in the Manchester parks. As it is, no less than £1,500 a year has to be spent on this purpose.

Smoke plays no part in the formation of fog ; it only transforms what is inocuous into a thing deadly and evil—smoke fog seems somehow to be the very embodiment of evil. And yet the fog merely concentrates and renders more palpable what we are actually breathing, in greater dilution, every day. During fog, so to speak, we have to take the whole bottle full instead of our usual daily dose of poison. We receive a multiple ration of what D. H. Lawrence calls the black manna from the skies of doom.

At the same time our powers to resist disease and ill-health are lowered, especially during the winter when fog is most prevalent, by an absence of sunlight : the smoke, in addition to its direct attack also cuts the lines of communication with health's greatest ally, the sun. We emerge from the gloom of our urban winters into spring with lungs seared with acid and choked with tarry soot, and possessing a consciously physical desire for sunlight ; what can truly be described as sun-thirst.

A point that is very easily overlooked in discussing these problems of health, but which is most important, is that while the combined effects of dirt-filled air and lack of sunlight do not make everybody consciously ill, they do inevitably cause us to be *less well* than otherwise. Illness is the opposite of full health, and in between these extremes is a long range of neither actual illness nor perfect health. It is safe to say that we are all lower down on the ladder of health than we would be if we enjoyed more sunlight and breathed purer air. The smoke nuisance brings death to some, sickness and disease to many, and a loss of vitality and fitness to all. The sun-thirst that we experience during the winter is not a mere psychological hankering after warmth and light ; it is an actual physical craving of the body for all the sunlight brings, as real as a thirst for water. It is a symptom that the body is lacking in something that is essential to its well-being.

Our pagan ancestors, after their long, cold, and cheerless winters, also experienced this sun-thirst and celebrated the coming of spring with joyous festivities at Easter time ; welcoming the re-birth of the sun, and of warmth and light. In most respect we have made winter an infinitely more tolerable season than they ever knew ; but they, at least, enjoyed what little sunlight there was, and breathed pure, sweet air. Some day, perhaps, we shall be civilized enough to try to emulate them.

# Is Air Pollution Decreasing?

A paragraph in the last Report on the Investigation of Atmospheric Pollution respecting the absence of improvement in the atmosphere of London during the last ten years seems to have been interpreted in the Press and elsewhere as a sign that the smoke abatement movement is not, after all, producing the cleaner atmosphere that is desired.

The particular case of London will be mentioned later ; but the discussion has prompted an examination of the deposits measured at the soot-gauge stations throughout the country, with a view to making a general survey of the results. Unfortunately such a survey cannot extend very far back, for the number of stations taking records in the first half of the last decade, and continuing until now, is small. A fairly wide field is covered by the years 1926-31, and these six years, for the purposes of comparison, have been divided into two periods of three years each. (Table on p. 137).

Each of the 18 stations recording continuously over these periods, has been included. The yearly totals are liable to fluctuate considerably and accordingly the mean deposit for each station for each three-year period has been determined. The figures for the total solids, tar, and sulphates, have been obtained and are given in the accompany table. The total solids deposit is the most complete measure of pollution, and the tar and sulphates are vaulable as being more directly a measure of the emission of the products of coal combustion. The tar produced is largely from domestic fires, and, being insoluble, is not as affected by variations in the rainfall as are the more soluble constituents.

It will be observed that the second three-year period in each case shows an appreciable decrease over the first period ; and the 25% diminution of the Tar deposit would appear to be especially significant. It must be emphasized, however, that the six years surveyed is too short a time, and external influences of one kind or another too numerous, to permit any definite assertion being made. Nevertheless, there does seem to be a marked favourable trend which in reality may be either somewhat more or somewhat less than is indicated by the percentages given.

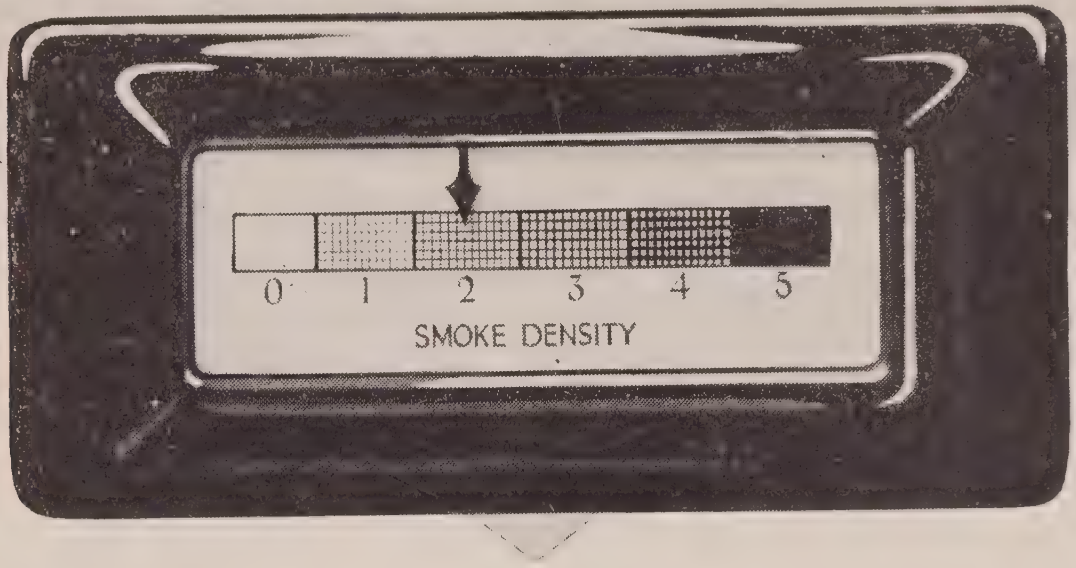
That there is a more definite improvement over a longer period of years may be shown by comparing the 1929-31 averages with the few comparable figures which follow, each of which refers to the total solids deposit :

| | | | | |
|---|---|---|---|---|
| Leeds (Hunslet) .. | 17,476 | (1907- 8) | 11,403 | (1929-31) |
| Birmingham (Cen.) | 27,612 | (1914-15) | 15,718 | „ |
| Liverpool .. .. | 22,464 | (1914-15) | 22,771 | „ |
| Kingston-upon-Hull | 16,146 | (1914-15) | 12,875 | „ |
| London (Mean) .. | 16,062 | (1914-15) | 10,639 | „ |
| Glasgow (Mean) .. | 17,784 | (1915-16) | 10,582 | „ |

(gms. per sq. dekametre)

There is little doubt that, on the whole, a gradual but certain lessening of the smoke nuisance is being achieved. It is stated by those who were concerned with smoke abatement at the end of the last century that there is a vast difference, especially with industrial smoke, since then. One authority estimates that there has been a 90% reduction of dense black smoke in Manchester during the last thirty years.

## THIS INSTRUMENT TELLS YOUR FIREMAN HOW MUCH SMOKE HE IS MAKING



# *Smoke represents wasted heat*
# **GAS COKE** *cannot* make smoke

When a chimney belches smoke it is doing more than polluting the atmosphere, it is in effect *sending money up in smoke.* There is *no such* waste with Gas Coke. It is the cheapest and most effective smokeless fuel for Steam Raising, Hot Water, Central Heating or Oven Furnaces.

This has been proved bv independent boiler tests on commercial plants, where net efficiencies *up to 86%* have been obtained; and in actual working practice at many different undertakings — some of which have saved *from 25% to 50%* on their fuel bills through changing over to Gas Coke.

Gas Coke is *demonstrably* cheapest on first cost, on installation costs and on maintenance charges. It will burn in any ordinary type of boiler without alteration to the existing plant. Gas Coke makes no smoke, makes no soot, and does not foul heating surfaces. *And Gas Coke is 100% British.*

We should welcome the opportunity of showing how Gas Coke may save money in your business. The Technical Adviser to the London and Counties Coke Association will personally investigate your special needs, freely and without obligation, and advise you helpfully and impartially.

### SEND FOR THE NEW, ILLUSTRATED BROCHURE, CONTAINING INSTRUCTIONS ON THE ART OF SUCCESSFUL BOILER-FIRING

A copy of this Technical Brochure, "Smokeless Gas Coke for Central Heating and Steam-Raising" will be gladly sent free, on application. It gives concrete examples of economies which have been effected through the use of Gas Coke in undertakings ranging from Hospitals to Power Stations. It contains also the reports and statistics of independent tests. Write or 'phone to:

THE LONDON & COUNTIES COKE ASSOCIATION,
9 GROSVENOR GARDENS, S.W.1. VICTORIA 3666.

Or you can apply to THE COAL MERCHANTS' FEDERATION,
7 Victoria Street, S.W.1. - - - - - Victoria 5005.

## Gas Coke is *smokeless, cheap & clean*

Kempton's

COKE FIRES

Smokeless
Labour-
Saving
Economical
Attractive.

*Write or Telephone to :-*

**C. H. Kempton & Co. Ltd.**

72, BENNERLEY ROAD,
S.W. 11
BATTERSEA 4991

Head Office :-
STANGATE HOUSE,
WESTMINSTER BRIDGE RD.,
S.E. 1.

W-D

# Our Ideal
# "A Smokeless City"

The

**WOODALL-DUCKHAM COMPANY**

are

manufacturers of

**Continuous Vertical Retorts**

**Intermittent Vertical Chambers**

and

**Other Plants**
for
**Conserving Coal**

and

**Providing Smokeless Fuels**

Head Office:-

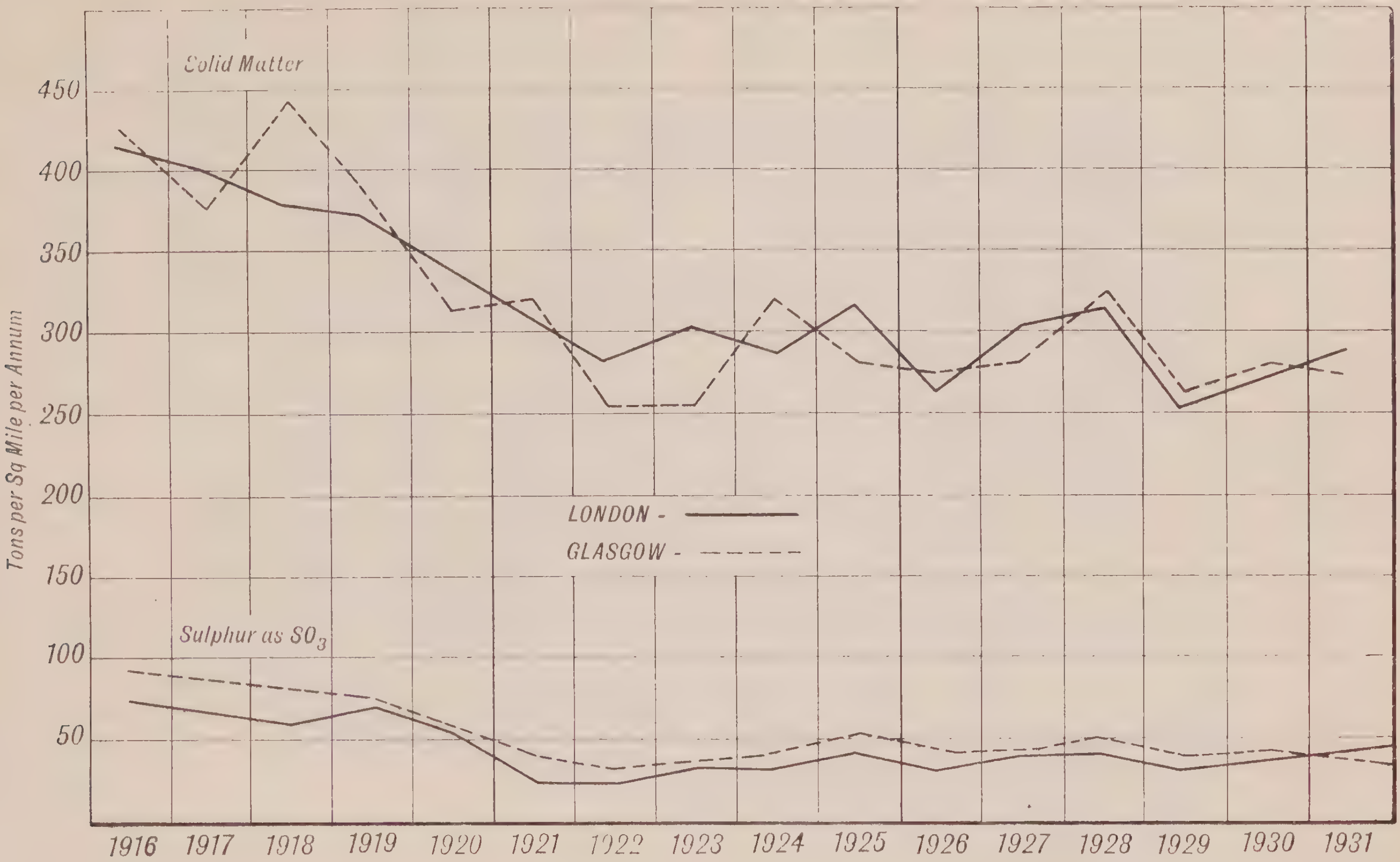
ALLINGTON HOUSE 136-150 Victoria St., LONDON, S.W.1

District Offices:-

GLASGOW
82 Gordon St.,

SHEFFIELD
22 High St.,

*THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO., (1920) LTD.*



"THE ENGINEER"

Special factors which must be taken into consideration in examining the present figures are: (*a*) the effects of the industrial depression in lowering the totals; (*b*) the effects of approximately two million houses erected since the war in increasing the totals; and (*c*) the variations caused by the rapid industrialization of certain areas, especially in the south.

The almost stationary figures for London are the mean of eight stations, and that the decrease is not greater is no doubt largely due to the last two of these factors. It is likely that, except for the increasing use of smokeless fuels, there would have been an actual increase in the pollution of London's air during the last decade. The accompanying chart, which illustrated an article by Mr. J. B. C. Kershaw in "The Engineer" (to which acknowledgement is made for their kind permission to reproduce it) shows how in both London and Glasgow the marked fall from 1916 to 1921 has been checked but not reversed. When the rate of building slackens, the effects of the continued growth in the use of smokeless mediums, which are at present masked by this influence, will again become more noticeable. The new houses, although largely equipped with gas and electricity, do, with few exceptions, use coal for some purposes, so that while they are not polluting the atmosphere to the extent that the older houses are, the net results are adverse.

Other individual figures in the tables are of interest. Thus there is the remarkable constancy of Liverpool's deposit since 1915 in the neighbourhood of 23,000 gms. per sq. dekametre; and the remarkable fall in the deposits recorded at Cardiff and Gloucester by 47% and 55% respectively. The decrease for St. Helens is probably partly due to the industrial depression.

The actual improvement in the atmosphere, and the rate at which it is improving, will not be definitely ascertainable, in general, for some years to come. In the course of a decade, however, there will be figures from enough stations to enable a more satisfactory analysis being made. It is hoped, therefore, that the authorities at present making observations will continue to do so, and that a considerable number of new stations will be established. In this connection it is hoped that the valuable resolution recently passed by the Society of Medical Officers of Health, urging such steps, will be acted upon.

The method used, although perhaps the only suitable one, is from the scientific viewpoint, only of limited accuracy; and in particular it is difficult to obtain any true comparison of the degree of pollution in different towns. A gauge in one town may be situated at a point of maximum pollution; whereas, in another town the gauge may be placed some distance from such a point, and possibly a lower deposit recorded even though the general pollution of the air may be higher. At the same time, the placing of the gauge at the point which has been shown, by test, to give the maximum deposits, would not necessarily be a measure of the general degree of pollution: the maximum point might easily be abnormal and out of proportion to the general level. Possibly the best solution is the establishment of a

SIMPLEX

EXTINGUISHERS

SODA, ACID, AND

FOAM TYPE

finest quality-
perfection in-
operation - -
fully approved
by all insurance
companies - - -

MATHER & PLATT Ltd
PARK WORKS ~ MANCHESTER

group of gauges throughout the area, in the way that was commenced, but not continued, at Rochdale. The mean of the deposits of these would than be much more comparable with the similar means of groups in other areas than are the present isolated stations. At present only the nine gauges at Glasgow and the eleven at London can be said to do this, and even these are widely separated They cover areas of 47 and 117 square miles respectively (municipal and L.C.C. areas), which is equivalent to one gauge per five square miles in Glasgow and one per 10½ square miles in London. The single, isolated gauge measures the deposit of its own neighbourhood only ; and over a period of years reflects not necessarily the changes in the pollution of the town in which it is situated, but possibly only the changes, which may be abnormal, in its immediate vicinity.

ATMOSPHERIC POLLUTION. Analyses of Total Solids, Tar, and Sulphates : Giving the average for each station for the Periods 1926-28 and 1929-31. (Grams per square dekametre).

| STATION | Total Solids | | Tar Deposit | | Sulphates Deposit | |
|---|---|---|---|---|---|---|
| | 1926-28 | 1929-31 | 1926-28 | 1929-31 | 1926-28 | 1929-31 |
| Birmingham, Central . . . . . . | 14,889 | 15,718 | 151 | 170 | 1,827 | 1,669 |
| Bournville, Works . . . . . . | 7,788 | 5,063 | 71 | 55 | 892 | 533 |
| Bournville, Village . . . . . . | 5,557 | 4,244 | 48 | 45 | 776 | 482 |
| Cardiff . . . . . . . . . . | 14,805 | 7,972 | 320 | 83 | 1,046 | 915 |
| Glasgow (Mean) . . . . . . | 10,648 | 10,582 | 101 | 91 | 1,750 | 1,542 |
| Gloucester . . . . . . . . | 13,320 | 6,001 | — | — | — | — |
| Kingston-upon-Hull . . . . . . | 17,937 | 12,875 | 140 | 159 | 2,606 | 1,979 |
| Leeds, Urban (Mean) . . . . . . | 14,817 | 12,350 | 175 | 165 | 1,877 | 1,238 |
| Leeds, Headingley . . . . . . | 4,957 | 4,770 | 68 | 51 | 784 | 670 |
| Liverpool . . . . . . . . | 23,179 | 22,771 | 235 | 245 | 2,930 | 2,617 |
| London (Mean) . . . . . . | 11,483 | 10,639 | 145 | 160 | 1,458 | 1,382 |
| Marple . . . . . . . . . . | 6,762 | 6,010 | 218 | 213 | 1,408 | 1,018 |
| Newcastle-upon-Tyne, Town Moor . . | 10,503 | 9,675 | 251 | 127 | 1,774 | 1,661 |
| Newcastle-upon-Tyne, Westgate . . | 17,555 | 15,685 | 484 | 247 | 2,844 | 2,278 |
| Rothamsted . . . . . . . . | 4,317 | 4,485 | — | — | — | — |
| Rotherham . . . . . . . . | 15,241 | 15,608 | 215 | 169 | 1,156 | 1,164 |
| St. Helens . . . . . . . . | 25,241 | 17,466 | 344 | 230 | 3,102 | 2,066 |
| Southport, Hesketh Park . . . . | 5,077 | 4,929 | 46 | 61 | 715 | 655 |
| TOTALS . . | 224,068 | 186,843 | 3,012 | 2,271 | 26,945 | 21,869 |
| AVERAGE PER STATION . . | 12,448 | 10,380 | 188 | 142 | 1,684 | 1,367 |
| DECREASE PER CENT. . . | 16.6 | | 24.5 | | 18.9 | |

**To Readers :**

We are anxious to increase the membership of the Society and the circulation of the Journal, and should therefore be grateful if readers would either (*a*) pass on the Journal after reading to someone who may be interested, or (*b*) send to us the names and addresses of possible members or subscribers to the Journal to whom we shall be glad to send complimentary copies of the Journal and other literature.

---

The smoke nuisance was among the subjects discussed at a recent conference of the County of Durham Federation of Women's Institutes. The following resolution was adopted with one dissentient :

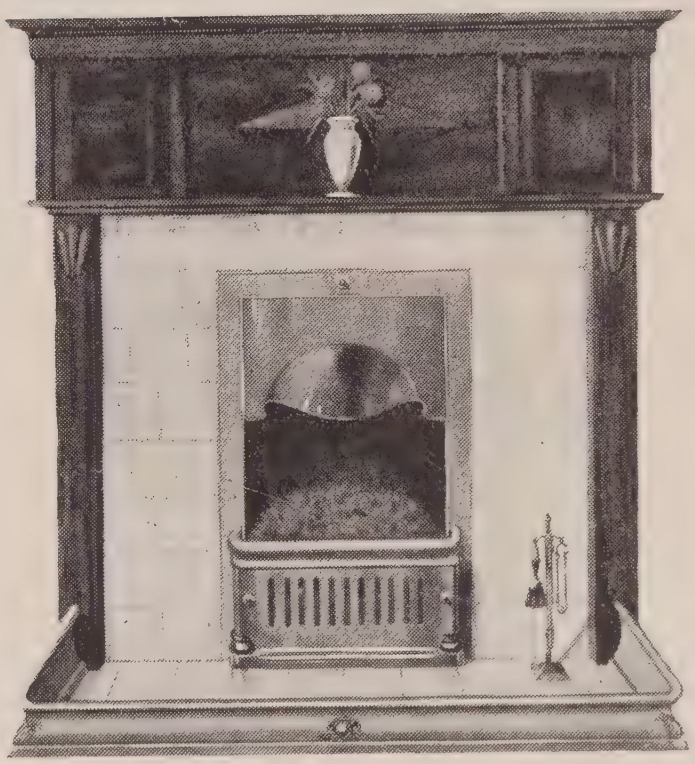
"That the Women's Institutes of this country could greatly assist child welfare work by devoting some of their energy to the reduction of atmospheric pollution by smoke."

---

"Must Britons be condemned for ever to wallow,  
In filthy soot, noxious smoke, train oil and tallow :  
And their fumes for ever to swallow,  
For with sparky soot, sniffs, and vapours men have constant strife,  
Those who are not burned to death are smothered during life."—WINSOR.

# 'SANTORE' the new Coke Fire

*Economy of Fuel*
*Bright open fire*
*Smokeless*
*Sliding Canopy*
*Ventilating Front*



*Perfect Control of*
*Fire from dull red*
*to bright white*
*Adapted for Hot*
*Water Supply*
*if required.*

Stout Cast Iron Interior, Cast Iron Fire Bars, Damper and frame fitted Wrot Iron Rod and Knob. Refractory Fire brick back and bottom.

*Write for details and modes of Fittings to the makers ................................................................ ....*

**NEWTON CHAMBERS & Co., LTD.**

**MOORHEAD,**
**SHEFFIELD,** Eng.

*Tel. Add.: "ENSEE," SHEFFIELD.*
*Tel. No. 20351 (2 Lines).*

M
B

# Notes and News.

### The Society of Medical Officers of Health.

A deputation from the National Smoke Abatement Society was recently received by the Society of Medical Officers of Health, when it was urged that steps be taken to promote a wider interest in smoke abatement among the health authorities throughout the country. As a result of this meeting the following valuable resolution has been passed by the Council of the Society of Medical Officers of Health; and it is hoped that this will stimulate much greater action among the many authorities who have not hitherto concerned themselves with the work which is indicated. The resolution reads:

> "That the Society of Medical Officers of Health is convinced that atmospheric pollution by smoke and other products of combustion, with the consequent deprivation of natural sunlight in our cities and towns, is an important cause of ill-health in this country; and therefore considers it desirable that systematic observations of the state of the atmosphere, including estimations of soot deposit, chemical constituents, gaseous pollution, penetration of ultra-violet rays, etc., should be carried out by means of scientific apparatus, such as the standard gauge, the standard automatic filter and various other instruments recommended by the Department of Scientific and Industrial Research, as a matter of routine by public health departments."

### The Handbook: Seventy Reviews.

The Smoke Abatement Handbook has enjoyed a very gratifying reception and excellent sales. Over seventy notices and reviews of the publication have appeared in the technical and daily press, and these, without exception, have spoken favourably of it. Some of the statistics and facts it contains have created considerable interest, and there is no doubt that millions of people have learned something concerning the smoke nuisance that they had not known before.

A large edition had been printed and there are still a considerable number of copies remaining. May we again appeal for the co-operation of members in disposing of these in the most useful manner? Especially would we suggest that municipalities, firms, and associations might assist in what is an excellent way of spreading smoke abatement information. For large quantities there are the specially reduced prices. One City Corporation for instance has purchased 250 copies for distribution among the members of its Council and its officials.

### A Record of Progress.

It may be of interest to those readers who are not aware of it, that a complete record of press-cuttings relating to smoke abatement is kept at the Society's offices in Manchester. These are retained in loose-leaf form until the end of each year and are then permanently bound in book-form. Many hundreds of cuttings, dealing with every aspect of the subject, are preserved in this way each year, and form a valuable guide to past events. They are divided into sections as follows: Annual Conference, Atmospheric Pollution, Conferences and Meetings, Foreign, Health and Sunlight, Industrial, Legislation, Local Authorities, Miscellaneous, N.S.A.S., Power Stations, Pretreatment of Coal, Prosecutions and Complaints, Reviews of N.S.A.S. Publications, Smokeless Fuels and Methods. These records may be consulted by any person seeking information, and any inquiries regarding the subjects dealt with will be gladly answered.

### Note on the Administration of the Law.

"'We have too many officials and some very stupid laws. A short time ago the captain of our steamer *Hadrian* received a summons for ejecting black smoke on his journey up the Thames. He went to Court, and when asked what he had to say, replied that he could not run a steamer without smoke. The magistrate was rather pleased to hear this blunt truth from a north country skipper, and replied that he quite agreed with the captain. After reprimanding the inspector for wasting the captain's time and that of the Court over such trumpery affairs, the magistrate dismissed the case.'—Sir Arthur Sutherland."—*Shipping World.*

"The smoke from a town can provide, under proper conditions, an extraordinary sight from the air. During the war I was stationed ten miles north-east of Oxford, and sometimes its smoke would form a compact layer streaming up on the south-west wind over our aerodrome and on into the distance with such a definite edge that one could fly along it to the city.

How widely it stretched I do not know, because as I turned into it I saw it no more; and to see it clearly one had to be at its level and some hundreds of yards outside it. It was something of a shock to see this almost tangible veil of town smoke spread between the sun and that remote and unsuspecting countryside."—*Correspondent in the "Sunday Times."*

### Ultra-violet Radiation Measurement.

Daily measurements of ultra-violet light, using the method developed by Dr. J. R. Ashworth, are made at the offices of the Society in Manchester and at Hale, nine miles away. The average intensity at Hale for the year ended February 29th, 1932, was 62.3 units; whereas at Manchester the average intensity was 45.9. There is thus a loss in Manchester of 26.9% of the ultra-violet light, compared with Hale. The loss during the winter months is 30.3%, and during the summer 21.9%.

### The Airclar Smoke Eliminator.

A visit was recently made, on behalf of the Society, to view an installation of the "Airclar" smoke eliminator. This appliance consists of a series of two or more ejectors fitted at the front of the furnace above the door. A jet of steam, mixed with induced air, is admitted through these, and, by producing a turbulence above the fire, assists in the combustion of the volatile matter and the prevention of smoke. The jets are automatically controlled and after a short period following stoking operations, the time of which can be regulated, are cut off. The opening of the furnace doors automatically brings the jets into operation again ; and thus their correct functioning cannot be forgotten or neglected by the fireman.

The boiler inspected was of the vertical type, working at a moderately high steam pressure, from which considerable smoke emission had been made prior to the fixing of a double-injector Airclar. To observe the results without the appliance in action the steam supply was shut off and the furnace stoked. A large amount of dense black smoke was emitted. Two firings with the Airclar in operation gave, in the first case, no smoke at all, and in the second case, a short period of moderate smoke. There was undoubtedly a considerable reduction in the smoke emitted. The appliance was also in use on an adjoining Lancashire boiler, but, as this was being started up and there was not suffcient steam pressure to permit the full operation of the Airclar, no definite conclusions could be made upon its efficiency in this case.

It was stated that it had been possible to use a cheaper grade of coal on both boilers since the installation of the appliance ; and that a higher efficiency, together with less smoke, had been obtained.

# An Effective Argument.

EASTCOTE, DELAHAYS R$^{\text{D}}$, HALE, CHESHIRE

Tel.: Altrincham 2066. ❧ ❧ ❧ Bus: Hale Barns, Queens R$^{\text{D}}$

An Effective Argument for Smoke Abatement—the Letter Heading used by a member of the Society.

# Correspondence.

### The Measurement of Smoke.

*The Editor, J.N.S.A.S.*

SIR,

I have been reading with interest Captain J. Frazer Shaw's paper on "The Measurement of Smoke," and particulars of the research work being carried out, in order if possible, to find an instrument capable of showing with some degree of accuracy, the amount of solid matter contained in smoke. There is no doubt that if such an instrument was possible, it would "standardize" and to some extent give uniformity of action with regard to smoke nuisance. It would also reduce to a minimum the "human element" and this would be an advantage, for at present what one person may consider a nuisance, others would not.

As an Inspector with a number of years' experience in this matter, I would like to put forward some of the varying factors which have a considerable bearing on smoke observations, in order to show the difficulties which will have to be met and overcome.

1 The necessity of taking observations unknown to the manufacturer.

NO
SMOKE SOOT
DUST or ASHES

if you let HADENS instal MODERN SYSTEMS for

STEAM RAISING, CENTRAL HEATING,
HOT WATER SUPPLY, VENTILATION,
by
OIL-FIRED BOILERS
ELECTRIC THERMAL STORAGE

Extensive Experience. Many Installations.

G. N. HADEN & SONS LIMITED
Estab. 1816

*Heating, Ventilating and Electrical Engineers*

*Works and Head Office* TROWBRIDGE

*Also at* LONDON, MANCHESTER, BIRMINGHAM, GLASGOW, DUBLIN, LINCOLN, BRISTOL, BOURNEMOUTH, NEWCASTLE, TORQUAY, LIVERPOOL, EASTBOURNE

"AIRCLAR"
STOPS
SMOKE

On All Grades of Coal
Cheap and Easy to Install.

Demonstrations can be given at any time in—
LONDON & MANCHESTER

AIRCLAR & CO.
53, VICTORIA STREET,
LONDON, S.W.1

NATIONAL
SMOKE ABATEMENT
SOCIETY

FILL UP THE FORM YOU WILL FIND IN THIS ISSUE **NOW** AND BECOME A MEMBER OF THE SOCIETY & A REGULAR RECIPIENT OF THIS JOURNAL.

THERE'S NO TIME LIKE THE PRESENT !

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COAL
NATURE HAS HERSELF PROVIDED

# ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—
**DOMESTIC HOT WATER BOILERS**
**CENTRAL HEATING**
**OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING**

* * *

*ENQUIRIES AND DESCRIPTIVE LEAFLETS :—*

**AMALGAMATED ANTHRACITE COLLIERIES LTD.**
120, FENCHURCH STREET,
LONDON, E.C. 3.

2 The position of chimneys, where it is impossible to obtain a clear background.

3 The various classes of fuel used other than coal, *viz.*, coke, residue wood, seed husk, paper, etc.

4 Varying chimney diameters, showing smoke columns of different diameters.

5 Varying coloured background—due to atmospheric conditions.

6 Velocity of flue gases, varying with wind velocity, and with the speed of the fan where mechanical draught is used.

7 Wind velocity, varying at all times during observations.

The three best-known methods of observation are the use of the Ringlemann Chart, the use of the Tintometer or Carboscope, and observation with the naked eye, and I will give you my experiences of the three methods.

In order to use the Ringelmann Chart a position of observation must be found where the chart can be placed at a suitable distance, and the chimney with a clear background can be easily observed, with the smoke striking at right angles from the line of vision. When this has been done and observations have commenced, the people in the vicinity have become curious with regard to what is taking place, the manufacturers' employees have also become curious, with the result that a false observation is recorded.

Where coke, residue wood, seed husk or waste paper are being used as fuel, though smoke may be excessive and dense, the reading seldom exceeds No. 2 on the Chart.

Similar results apply when using the Tintometer or Carboscope, though the attention drawn is not so conspicuous as when using the Ringelmann Chart.

Ordinary observation with the eye is not infallible, and it is surprising how keen the eye becomes after a few months' observation, but, as stated previously, every Inspector has his own minimum standard. This raises another point, and that is, how rarely the defence is made that the smoke was not emitted. Defendants plead " best practical means," and often state that the bursts of smoke were not sustained for the length of time given by the prosecution, but a " direct denial " of nuisance is a rare defence.

It must always be kept in mind that the Inspector has to make his observations at all times of the day, early morning and late evening, and at all seasons of the year. In large industrial areas he observes very low chimneys among factories, with no definite background to work upon. He has not a great amount of time to consider whether he shall, or shall not, record an emission, for the state of his chimney smoke is continually changing. In all cases the manufacturer gets the benefit of any doubtful emission that takes place. Fog and hazy conditions are the Inspector's chief obstacles, for then observations are impossible.

I was surprised to read that the Ministry of Health are doubtful that at present Section No. 2 of the Public Health (Smoke Abatement) Act, 1926, giving Local Authorities power " to make bye-laws regulating the emission of smoke of such colour, density or content as may be prescribed " can be successfully applied on account of this difficulty of accurate smoke measurement.

If this doubtful attitude is set up by the Ministry, it gives Local Authorities little encouragement to ask for and to apply bye-laws, which simplify the method of procedure in dealing with Smoke Nuisance considerably. It also causes a considerable amount of doubt in the minds of Inspectors who are trying to prevent pollution, as to what definite standard to apply.

Personally the question of " colour, density and content " has not been looked upon with any degree of difficulty ; the fixing of a suitable uniform " Time Standard " has presented a greater problem.

The Ministry put forward as a general recommendation that a uniform " Time Standard " of two minutes in thirty should be the standard to be aimed at. I wonder if batteries of hand fired Lancashire Boilers were considered when this recommendation was made ? I have in mind a battery of 16 boilers while writing, and how any practical engineer or administrator could expect a power station of this class to conform to a " time limit " of two minutes in thirty is difficult to understand. There are a number of such power stations in this Area, and it can be taken for granted that there are similar stations in the industrial districts of the north.

Prosecutions take place at the present time for various classes of smoke, *viz.*, " black " smoke, " brown " smoke and " dense " smoke. A much better solution to this would be to ask for bye-laws for " Excessive " Smoke, which could be further defined as " Opaque Smoke " for a distance of 1 foot after leaving the chimney. This would eliminate the " black," " brown," and " dense " classifications.

It would be helpful if other views of this problem could be obtained, preferably from Inspectors who are experiencing the same difficulties.

In conclusion, I would not like to state that the Measurement of Smoke cannot become an accomplished fact, or that an instrument that will record the same with any degree of accuracy is impossible, but with the knowledge at present before us, this instrument appears very improbale.

Yours faithfully,

JAMES LAW,

Chief Smoke Inspector, Sheffield, Rotherham, and District Smoke Abatement Committee.

# *The* ADVANCE GUARD *of* HEALTH *and* HAPPINESS!

ELECTRICITY—has banished thousands of air-polluting factory chimneys, and to-day in many districts is rapidly reducing the volumes of domestic smoke.

Interesting leaflets on the application of ELECTRICITY to modern uses will be forwarded post free, on request

*to*

**THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.,**
**15, SAVOY STREET——————STRAND, LONDON, W.C.2.**

---

**ELECTRICITY IS THE ENEMY OF SMOKE**

# Smoke Abatement.

*Abstract of a Paper presented by Mr. V. R. Chadwick, A.M.I.Mech.E. at a joint Meeting of the Institute of Fuel and the Society of Chemical Industry at Bristol on February 4th, 1932.*

Combustion engineering is an exact science ; human nature is not. Problems connected with the former can be proved conclusively in the laboratory and boiler house, whilst problems connected with the latter—as in the case of politics—can never be conclusively proved, but remain a "gamble" dependent on the results obtained by the exponents of a particular system in the attack upon the intelligence or cupidity of the masses by means of propaganda, generally of the "cartoon and wildly exaggerated" variety.

There has been a tendency lately, especially in the daily press, to colour any smoke abatement propaganda with fantastic statements, such as "Millions Wasted Annually in Smoke," etc., and to treat the matter as one of politics, appealing to human nature, instead of to reason and proving statements by science.

It should be unnecessary after sixty years of compulsory education, to resort to any such reasoning. The journalist obtains what he terms "good copy," the public read it in that easy-going, non-thinking attitude of mind which the modern Press has developed, and the trained engineer figuratively shrugs his shoulders, but does not think it worth his while to contradict statements which do not directly affect him.

Many very excellent papers have been read on smoke abatement from the public health point of view, and much good work has been and is being done by the Royal Sanitary Institute, the National Smoke Abatement Society, and others, in pointing out the damage to health and property by smoke and fumes, but just in the same way that the pioneers of motoring have made possible the modern motor car and aeroplane, so technical education, the Institute of Fuel, and the Federation of British Industries, by bringing together steam users and combustion engineers, are making possible the smokeless factories of to-morrow.

### Sulphur in Flue Gases.

The question of washing fumes for the removal of sulphur is still in the early experimental stage in this country. Clarence Dock, Liverpool, and the Battersea power stations are two well-known cases of which we have some information, but no definite figures have yet been given in regard to the cost of the fume-washing plant. From its very nature, it is bound to be expensive, especially when it is realized that the removal of sulphur dioxide requires 17 to 22 tons of water heated to about 165° F. per ton of coal burned.

We are on the eve of some very important developments in this particular phase of fume nuisance, and information is to hand of H. F. Johnstone's important researches at the University of Illinois, in which he has discovered that by using a 0.025 per cent. solution of manganese salts into the easily soluble sulphur dioxide ($SO_2$) into the easily soluble sulphur trioxide ($SO_3$), the manganese salts acting as a catalyst, using only $1\frac{1}{4}$ tons of water per ton of coal. If these figures are anything like correct, this important discovery is bound to be of immense benefit to the "smoke abatement" question in this country by ensuring a really innocuous chimney.

### The Burning of Rubbish.

An aspect of the smoke nuisance, and one which our local authorities with delightful inconsistency seem to encourage, is a request painted on the refuse collection carts to "burn your rubbish and save the rates," and when a borough council encourages people to deliberately create such objectionable smoke, and then passes bye-laws forbidding the amount of smoke from a chimney over 100 ft. high which dissipates comparatively harmless smoke and never comes in contact with any house of dwelling, we begin to realize the anomalies of the Act.

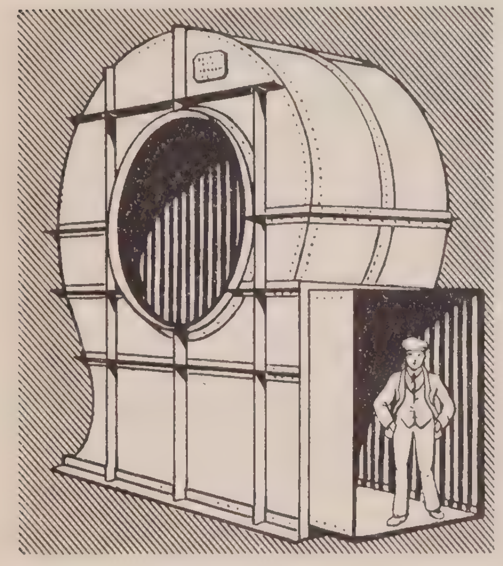
### The Products of Combustion.

Smoke, even dense, from a boiler chimney does not necessarily represent waste ; it more probably indicates efficiency ; but as it is illegal to emit black smoke, the harassed engineer has to try and effect a compromise and work at a rather lower efficiency so as to keep within the law. A large London factory can be cited as an example, where, with six Lancashire boilers, 30ft. by 8ft., each burning approximately 10 cwt. of Scotch bituminous coal per hour on handfired grates, it is possible to obtain 14 per cent. $CO_2$, but at this efficiency smoke is made, and they have to deliberately work round about 11 per cent. $CO_2$ with attendant lower efficiency so as to keep a smokeless chimney.

Generations of firemen have found from practical experience that their work is easier when the chimney is smoking little, and in many cases, where so-called "smoke consumers"—which depend for their success on dilution of the gases—have been fitted, they have been deliberately put out of action by the firemen.

Black smoke is not destructive just because it is black ; it certainly blots out the sunlight from our towns, but

# INCREASE YOUR BOILER EFFICIENCY...



The " Cyclone " System of Induced Draught effects a definite saving in Fuel Costs. It spells a double efficiency - a substantial increase of steam power - and the elimination of black smoke.

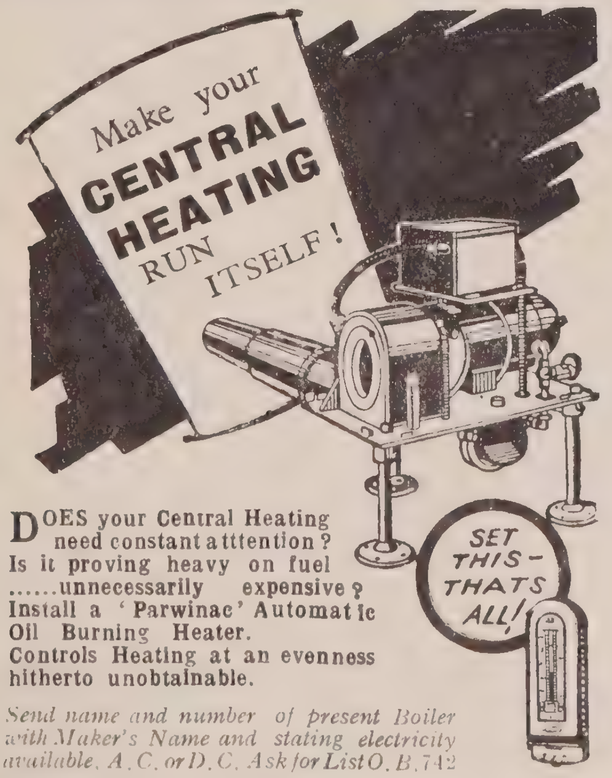
The low initial cost of installation is an incentive to take advantage of this application to Boiler efficiency of the latest scientific principals. You will find this claim substantiated by the facts set forth in Brochure 66F. Please write for a copy.

- *Write for Brochure 66F.*

**MATTHEWS & YATES LTD**
**SWINTON MANCHESTER**

*London Office :* 20, *Bedford Row, W.C.* 2.

---


Make your
CENTRAL HEATING
RUN ITSELF!
SET THIS—THATS ALL!

DOES your Central Heating need constant atttention? Is it proving heavy on fuel ......unnecessarily expensive? Install a 'Parwinac' Automatic Oil Burning Heater. Controls Heating at an evenness hitherto unobtainable.

*Send name and number of present Boiler with Maker's Name and stating electricity available. A.C. or D.C. Ask for List O.B.742*

**Parker, Winder & Achurch, Ltd.**
Broad St. Birmingham

London, 4 Gt. Marlborough St., W.1
Manchester, 16 John Dalton St. &
also at Leicester and Coventry.

Parwinac
**AUTOMATIC**
**OIL BURNING HEATER**

O.B.M.

---

ECONOMISE FUEL

BY USING THE

SEOTOO
FLUE GAS
CARBURETTOR
In Your
BOILER FURNACES.

SEND ALL PROBLEMS
RELATING TO COMBUSTION
TO

**Smoke Prevention Limited**
1 Victoria St., London. S.W. 1

the real destructive agents—sulphur and chlorine—are present even with the smokeless chimney, and the following table will give some idea of the weight of the component parts of the products of combustion **daily** poured into the atmosphere in this country :—

Products of Combustion.

| | | Domestic | Industrial |
|---|---|---|---|
| Annual total burned | tons | 37,000,000 | 88,000,000 |
| Daily average coal burned | ,, | 120,000 | 300,000 |
| Products of combustion daily | ,, | 30,000,000 | 10,000,000 |
| Tar and carbon | ,, | 2,400 | 1,500 |
| Carbon dioxide | ,, | 440,000 | 1,000,000 |
| Oxygen | ,, | 6,300,000 | 1,200,000 |
| Nitrogen | ,, | 23,700,000 | 7,700,000 |
| Sulphuric Acid | ,, | 7,200 | 18,000 |
| Chlorine | ,, | 300 | 750 |
| Ash | ,, | 600 | 3,000 |
| Calculated on excess of air of | % | 2,000 | 250 |

Coal burned in domestic fires will produce 100 cub. yds. of smoke or fumes per lb. equivalent to 224,000 cub. yds. per ton. On industrial boilers, 13 cub. yds. per lb. of fuel burned are produced, equalling 30,000 cub. yds. of smoke or fumes per ton of fuel.

The above table put on a volume basis shows that the daily emission of smoke and fumes from domestic chimneys would put a blanket over England, Scotland, and Wales, 3.6 in. thick, whereas that from industrial chimneys would be equal to a blanket 1.2 in. thick. Unfortunately, however, there is not always a high wind to dissipate the smoke equally over the country like this, and with an absence of wind we get the smoke concentrated ; in the case of an industrial town burning per day

37 tons domestic—7,000,000 cub. yds. of smoke and fumes.

88 tons industrial—3,000,000 cub. yds. of smoke and fumes, which if concentrated in three square miles, would give a smoke and fume blanket 1 ft. deep.

### Common Causes of Smoke.

Following a consideration of oil fuel, gas, pulverized fuels, patent fuel, the characteristics of fuels, and the characteristics of boilers for certain fuels, the author discusses some common causes of smoke :—

The manufacture of town gas is an example of the scientific production of smoke. The factors forming smoke are very few but simple.

1. Insufficiency of air to complete combustion.
2. Temperature too low to ignite the hydrocarbons.
3. Sudden cooling below ignition temperature of the hydrocarbons before ignition is completed.
4. Combination of the first two.

The first may be caused by dirty fires or insufficient draught. The second—a very common cause of smoke—is that the fire is allowed to burn too low before a charge of fresh fuel is put on, and the low fire having to supply heat to bring the charge of fresh fuel to ignition temperature, lowers the furnace temperature and retards combustion. One really inefficient result of smoke in a boiler is a deposit of soot on the boiler tubes. On a Lancashire type boiler, where the gases are not very suddenly cooled, this is not so prevalent. On a water-tube boiler, where the flame is suddenly extinguished, smoke is formed, and soot deposited on the tubes, which acts as an insulator and tends to inefficiency.

---

Modern industry, by its provision of laboratories and experimental staff, has proved that it is to the collaboration of the chemist with the practical engineer that it must entrust its future development. Manufacturers are realizing that when they buy a ton of coal costing a certain number of shillings, it contains so many heat units, and, if the books are kept properly and the business run on scientific lines, they want to know exactly where these heat units are used.

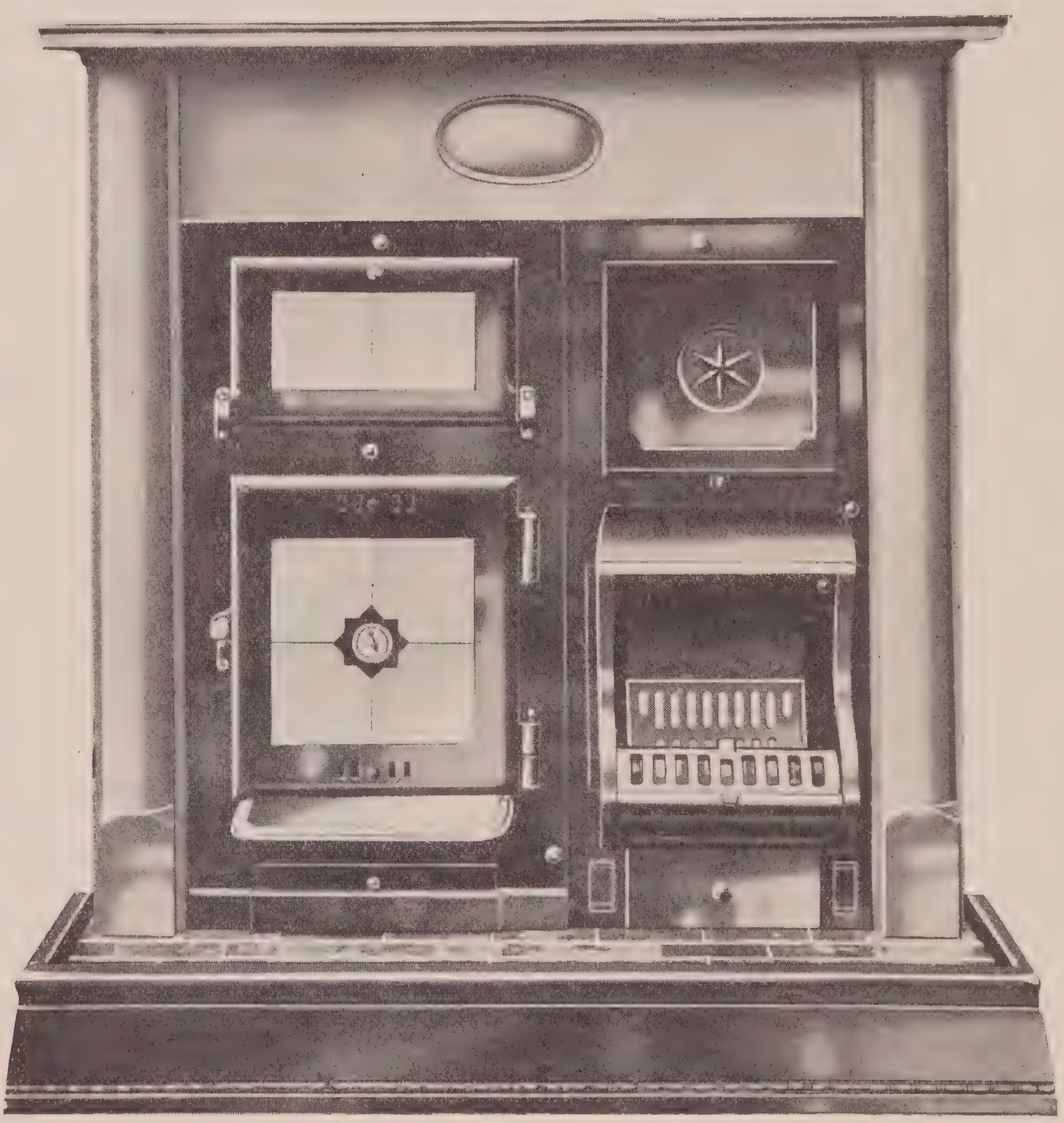
The term " Combustion Engineer " was quite unknown a few years ago, but it is now quite common, and manufacturers are realizing the fallacy of entrusting the burning of thousands of pounds worth of fuel per annum to what is regarded as unskilled labour, and expert supervision is being introduced to see that the very best results, compatible with the plant available, shall be obtained.

## SMOKE ABATEMENT—HEAT WITHOUT SMOKE

PRO. PAT. 7574. PATENT APPLIED FOR.

# "Southern Star" Domestic Cooker

TYPE "B"



### DETAILS OF TESTS.

Fuel—Coal, Coke, Coalite or other By-product Fuels.
Fuel Consumption—Under 4lbs. per hour.
ASH 4% of Fuel burned.
SOOT 3ozs. per week.
**HOT WATER.** Plentiful supply all day without using boiler damper. Baths 2 per hour, using boiler damper.
**OVEN.** Top and Bottom Heat.
Boiling—Pans **do** boil in Hot Closets.
Refuse—Household rubbish can be burned in this Stove.

### SOUTHERN STAR. TYPE "B."

Size 38×38×18in. deep.

Flues, Self Contained, save installation costs and ensure satisfactory operation.

**"Top and Bottom Heat" one Control.**

Oven, 17×15¾×15
Grill, 15×4×15.
Hot Closet, 11×14½×15
Hot Closet, 21×14½×8
Open and Closed Fire.

Particulars and Prices will be gladly submitted.

*MADE BY . . .*

## W. H MICKLETHWAIT & Co., Ltd.,

**Clough Works, Rotherham.**

# ATMOSPHERIC POLLUTION AND THE DOMESTIC FIRE.

## A NEW FIRE.

It is being gradually realised that the major portion of the smoke fog, and dirt, is not being caused altogether by the factory chimney but by the huge number of inefficient domestic fires.

The coal fire which can reduce the period of smoke emission and turn waste into heat will be a blessing to humanity, and will achieve the following advantages.

Save fuel, and thus conserve the fuel supply clear and brighten the atmosphere. Cooking and heating will be accomplished at less cost.

Undoubtedly the Domestic cooking range is the most important item of equipment in any homestead, but to meet the needs of the present day up-to-date and discerning housewife it must be efficient.

This problem has been thoroughly investigated by a Sheffield engineer and after exhaustive tests a series of Stoves have been manufactured by Messrs. W. H. Micklethwait & Co., Ltd., of Rotherham.

This Stove is known as "THE SOUTHERN STAR," and is the outcome of tests and experiments which have been carried out over a long period to reduce the smoke and ensure efficient combustion. Both results have been fully achieved in a remarkable and interesting manner.

Time tests carried out in conjunction with a Ringlemann Smoke Chart show that the smoking period of the new equipment is from 60 to 75 per cent. less than that from an ordinary coal-fired grate and the actual density of the smoke during the short period of emission is considerably less.

From the standpoint of pollution of the atmosphere the grate is a distinct advance upon any equipment on the market and the excellent results achieved are obtained by the ingenious admission of naturally and pre-heated air, which is provided by a simple air pre-heater incorporated within the combustion zone of the firebox. This device is quite automatic and self acting, but it reduces the smoke nuisance and ensures the liberation of more heat from the fuel being used.

This fire has the great advantage of efficiently burning inferio grades of coal and by-product fuels.

Several local authorities have investigated the claims made for this fire and an independent test made by the Sheffield Corporation (on a Model "A"), who have installed several, has revealed the following facts :—

Coal Saving per week—Stoves working 112 hours, $1\frac{3}{4}$cwts.
Soot deposit in flues per month—9 to 12ozs. ; soot removal only necessary once per month.
Hot Water plentiful, expeditiously.

The Model "B" illustrated will work efficiently six months without any necessity for flue sweeping.

An analysis of the ashy deposit taken from the flues of the "A" stove showed that the organic matter (Carbon) was only 16.91%.

The principle evolved has been incorporated into various units, notably Hospital Ward Heaters ; Shop Heating Stoves ; Large Installation Cookers and Heaters ; Domestic Cookers, incorporating Central Heating Boilers.

To show the high efficiency of these fires a large installation in Yorkshire has a double oven cooker for 250 persons using only 12lbs. of coal per hour and providing 30 gallons of **boiling** water per hour continuously.

To meet the objection of the semi-closed fire the principle has been incorporated into combination grates and interiors and these fires effect 30% saving in time to heat the oven, and a considerable reduction in smoke density, also less fuel is required.

The small amount of ash from these fires is attracting the attention of sanitary authorities who have to consider long rubbish hauls from housing schemes to destructor.

THE JOURNAL OF THE NATIONAL SMOKE ABATEMENT SOCIETY

is undoubtedly the ideal medium in which to advertise Smokeless Fuels and every appliance or device for minimising or abolishing the smoke nuisance. The advertisement rate is very moderate, while advertisers are assured of **every copy** of the Journal reaching the people who are working for this great modern reform. Smoke Abatement is not a theory ; it is not merely hygienic propaganda. **It is a step forward in the life of the nation.** The movement is making wonderful progress ; it is overcoming all old-fashioned prejudices. Its advance is irresistible. Every engineering firm which produces smoke-abating appliances, and every maker of smokeless fuels, should openly associate themselves with this great national reform, by advertising their products in the **only** National Journal devoted to Smoke Abatement.

Enquiries as to advertisement space should be addressed to the publishers :

**THE SERVICE GUILD**
**45, Deansgate Arcade, MANCHESTER.**

*Telephone :* BLACKFRIARS **9374.**

HODGKINSON'S PATENT AUTOMATIC STOKERS

Are guaranteed to prevent the emission of Smoke and Grits from Industrial Chimneys with the highest Economy and Efficiency and without the use of forced blast Steam Jets.

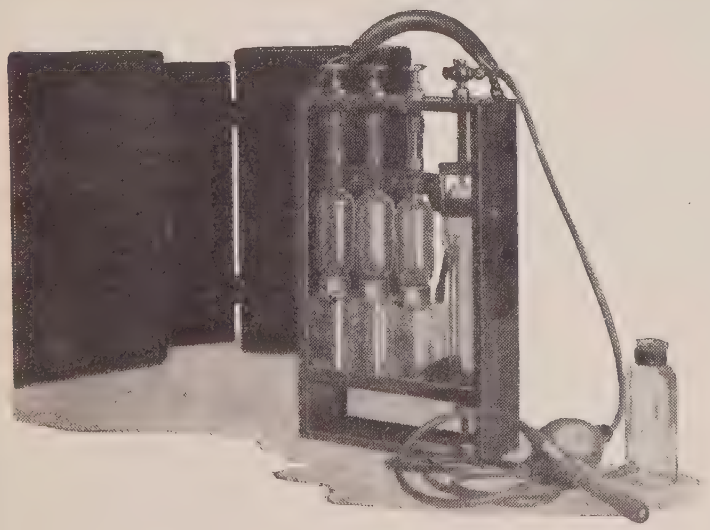
**JAMES HODGKINSON (SALF'D) LTD.**

FORD LANE WORKS,
PENDLETON - MANCHESTER

Telephone :
1491,2,3 Pendleton.

Telegrams :
"Incendo, Manchester."

**CO2 TESTS AT THE RATE OF ONE PER MINUTE ! !**



HAYS PORTABLE GAS ANALYSER.

The above analyser is still the most suitable instrument for making rapid, accurate, tests of the CO2 percentage in flue gases. Also deals with Oxygen and Carbon Monoxide.

*Full particulars from the makers*

**DUGUIDS LTD., LYMM, Cheshire**

**The Service Guild**

invites inquiries from any Society or Association desiring to publish a Handbook or Year Book without expense. The Guild undertakes such publications, (in cases where there is scope for obtaining advertisements) relieving its clients of all financial responsibility; producing and supplying the books entirely free of charge.

*Full Particulars from*

**A. E. SMITH,**
**The Service Guild,**
**45, Deansgate Arcade,**
**MANCHESTER.**

Telephone: Blackfriars 9374

# CLEANER CITIES

POWELL DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use :—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Lorries, etc.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are eminently suitable for use in modern mechanical stokers.

# BRIGHTER HOMES

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no soot, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes for various requirements :—

No. 1. Cobbles, for horticultural use and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, etc.

*For further particulars apply to :—*

**STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED**
**4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3.**
And at :—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull, Newcastle-on-Tyne, Glasgow, Belfast.

# BURN CHEAP COAL

## WITH AUTOMATIC CONTROL

**SMOKELESSLY, EFFICIENTLY, ECONOMICALLY**

FOR

CENTRAL HEATING

IN THE

PRIOR MASTOKER

*Ask for descriptive Leaflet from*

**SAUNDERS & TAYLOR LTD.**

Praed Road, Trafford Park, MANCHESTER.

**Telephone Trafford Park 2007** (3 lines)

---

# OIL OR COAL?

ACCORDING TO CIRCUMSTANCES EACH HAS ADVANTAGES
EACH CAN BE SMOKELESS IF PROPERLY BURNT

THE

**"PRIOR"**
OIL FIRING SYSTEM

THE SIMPLEST **OIL** BURNER IN THE WORLD

**Some of its Advantages:**

Low Air Pressure
Gravity Feed for Oil
No Small Jets
No Moving Parts in Burner
Soft Enveloping Flame
Flame Regulation Range 8 to 1
Thermostatic Control optional

*Let us send Particulars.*

THE

**PRIOR**
**MASTOKER**

A FULLY AUTOMATIC
UNDERFEED COAL STOKER
**FOR HEATING and DOMESTIC BOILERS**
*which effects*
A GUARANTEED SAVING of **25%** to **50%** as
compared with hand stoking
Under Complete Thermostatic Control
Absolutely Reliable
**We invite you to see it working**

**THE PRIOR OIL BURNER LTD.**

**5 CROWN YARD, STANHOPE ST., LONDON, N.W.1.**

CARDIFF AGENTS—
HAMPTON'S HEATING CO., LTD.,
18 CITY ROAD, CARDIFF.

MASTOKER AGENTS FOR MANCHESTER—
SAUNDERS & TAYLOR, LTD.,
PRAED ROAD, TRAFFORD PARK

# The Journal of the National Smoke Abatement Society

*Editor:* **Arnold Marsh, M.Sc.Tech.**

*Editorial Office:*
**23, King Street**
**Manchester**
**Telephone: Blackfriar 0896.**

*Advertisement Office:*
**The Service Guild**
**45, Deansgate Arcade, Manchester**
**Telephone: Blackfriars 9374**

Vol. 3. No. 11. 1932.

CONTENTS OF SUMMER ISSUE

| | Page | | Page |
|---|---|---|---|
| Fumes and Smoke Nuisances from Road Vehicles | 155 | Correspondence—Professor J. B. Cohen .. | 165 |
| The Weathering of Natural Building Stones .. | 157 | The Scottish Branch—Annual Conference .. | 169 |
| The Use of Gas Coke .. .. .. .. | 163 | Liquid Fuel as an Aid to Smoke Abatement .. | 166 |

*The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgments are made.*

# Fumes and Smoke Nuisances from Road Vehicles.

MEETING ON JUNE 3RD, 1932.

A MEETING which will probably mark a new phase in the smoke abatement movement was held at 71, Eccleston Square, on June 3rd. Up to that time the Society and its two forerunners had confined their attentions exclusively to problems concerned with the abatement of coal smoke. Lately, however, there has been a growing apprehension of the effects of atmospheric pollution caused by road vehicles, and it was considered that it would be of value to devote at least one meeting to a discussion on this subject.

Two papers were read. In the first Dr. J. S. Owens dealt with the scientific aspects of pollution caused by road vehicles; and in the second Mr. R. P. Mahaffy considered the question from the legal point of view. The papers are of considerable value, both in themselves and because they mark the initial approach to a problem that is unquestionably of serious dimensions. A full report of the meeting is not given in these pages, but is being published in pamphlet form.

From the addresses and the discussion which followed it was shown that the trouble caused by road vehicles is divisible into several distinct categories. There is first the emission of the invisible or odourless gas carbon monoxide, produced by the imperfect combustion of hydrocarbon substance such as petrol. Secondly there is a nuisance caused by the emission of oil vapours caused by faulty or excessive lubrication. This is not dangerous, but gives a nauseous and generally objectionable smell. Thirdly, there are more familiar nuisances caused by the emission of smoke, grit, and sparks by steam driven vehicles.

The last two are definite nuisances, but the first, the emission of carbon monoxide, is more than a nuisance : it is a grave danger to life. And the danger is increased because the gas cannot be detected by the person breathing it. It is, in fact, comparatively inactive, and has no physiological effect but one. This is its power to combine with the haemoglobin of the blood. The function of this substance is to combine loosely (as oxy-haemoglobin) with the oxygen received by the heart from the lungs, and to circulate this oxygen throughout the blood stream, oxidizing waste tissues. The affinity of this haemoglobin is greater for carbon monoxide than for oxygen, and accordingly in the presence of this gas, a cherry-red substance, carbonyl-haemoglobin is formed, resulting in a cessation of the vital action of oxygen and consequent asphyxiation.

The concentration of the gas in streets rarely approaches the danger limit, but, as Dr. Owens pointed out, there may be produced a combination of conditions resulting in a dangerous situation. In vehicular tunnels, congested traffic lines, and to the occupants of closed cars, there is the likelihood rarely of danger, but frequently of unpleasant and possibly accumulative, injurious effects.

Mr. Mahaffy, in the course of his admirably clear exposition of the legal aspects, admitted that there was no means of dealing with invisible gases ; but there were possibilities, he pointed out, of action being taken under certain sections of the Road Traffic Act and the Motor Vehicles (Construction and Use) Regulations. The nuisances caused by steam-driven vehicles do not really break new ground for the Society, for they are generally coal smoke nuisances, even though they have not been amenable to the control that has been exercised upon stationary boilers. It has been difficult to obtain convictions in the past, but it is hoped that the new regulations will be made use of, and that a highly obnoxious and unnecessary type of nuisance will be suppressed.

As a result of this preliminary meeting there is a unanimous agreement that the Society should continue to devote attention to these problems ; including them in its other activities. The effects of these road nuisances are not as extensive as those caused by the combustion of coal, but they may, on occasion, be experienced by individuals in a more concentrated and disastrous manner. The producers of coal smoke have frequently been suspicious of, and even antagonistic to, the words “ Smoke abatement ” ; but is is hoped that there will never be any reason for such an attitude among road-users. It is, indeed, the car and lorry driver who has the most to gain by the abatement of road fumes.

It is hoped, in the next issue, to publish some of the valuable data contained in the U.S. Bureau of Mines Report on “ The Ventilation of Vehicular Tunnels.” This, although primarily concerned with the atmospheric conditions of tunnels, contains much relevant information on the effects and occurrence of carbon monoxide.

In tackling this problem it becomes necessary to gather and tabulate information and facts. If readers who are in possession of information of any kind which bears upon the problem, would forward it to the Secretary of the Society, it would be greatly appreciated. In particular, authenticated information of carbon monoxide poisoning, serious or mild, would be valued.

# The Weathering of Natural Building Stones.

The Building Research Board (Department of Scientific and Industrial Research) has recently issued a valuable Report entitled " The Weathering of Natural Building Stones," by R. J. Schaffer, B.A., B.Sc. (Oxon.), (H.M. Stationery Office, 4s. 6d. net, pp. 149 x.).

The Report deals very comprehensively with the different causes of the weathering of stone, of which there are a considerable number ; discusses the preventive and remedial measures ; and concludes with a chapter on the testing of building materials with reference to the estimation of their durability. A lengthy appendix is devoted to a consideration of atmospheric pollution in relation to weathering.

Such a book cannot fail to be of great interest to those who are concerned with the abatement of smoke. It has for long been recognized that one of the most serious and noticeable effects of the smoke nuisance was the blackening and decay of building stone. Evelyn, in 1661, writing of London's smoke, said : " This is that pernicious Smoake that sullyes all her Glory, superinducing a sooty crust or Fur upon all that it lights, spoyling the moveables, tarnishing the Plates, Gildings and Furniture, and corroding the very Iron-bars and hardest Stones with those piercing and acrimonious Spirits which accompany its Sulphure ; and executing more in one year, than exposed to the pure *Aer* of the Country it could effect in some hundreds." The extensive damage at the present time was stressed in the Report of the Committee on Smoke and Noxious Vapours Abatement, and a valuable contribution to the literature of the subject was made by Sir Frank Baines at the Smoke Abatement Conference held in Manchester in 1924. A further account, by this eminent authority, appeared in this Journal (Spring, 1931).

The action of coal smoke and other artificial atmospheric impurities is, of course, only one of many factors causing stone to weather or decay. The book examines each of these factors at length, and it is made apparent that much of the decay of buildings is due to a lack of knowledge of the behaviour of stones under various conditions. The various agencies affecting buildings stones are classified as follows : inherent natural defects in the material ; faulty workmanship ; errors in the choice of materials ; chemical phenomena ; physical phenomena ; the action of soluble salts ; the action of living organisms.

## Chemical Phenomena.

The chapter on chemical phenomena is the particular concern of those interested in smoke abatement, for they are largely due to atmospheric impurities. The chief agents present in the air which affect building materials are carbon dioxide and acid sulphur compounds. Chemical decay is associated principally with materials which consist wholly or in part of calcium carbonate. The carbon dioxide acts by dissolving in water and reacting upon the calcium carbonate to form calcium bicarbonate. Calcium carbonate is again formed when the solution of bicarbonate is evaporated, but possibly in another part of the stone. Further, it is in finer form and is therefore more liable to the action of the acid sulphur gases. Carbon dioxide is produced by the action of the sulphur gases upon the calcium carbonate and this, in its turn, may react with the stone and so render the course of the various reactions more complex.

Of the acid sulphur gases it is emphatically stated that " there is no doubt whatever that, in this country, the action of these gases is the most potent cause of the decay of calcareous building materials." The primary effect of the acid gases is erosion due to calcium sulphate being more soluble in water than calcium carbonate. Magnesium sulphate, one of the products of magnesian limestone, is very soluble. If the action were confined to the washing away of the soluble sulphates the erosion would be relatively unimportant ; but the effects are much more complicated.

" The action of the acid sulphur gases on calcareous materials causes the formation of hard, impermeable surface skins, which tend to blister and exfoliate and thus to cause the development of an ugly type of decay. Since they not only mar the appearance of the stone, but also damage it structurally, these effects are particularly serious."

Skin formation does not occur on rain-washed areas, and so blistering and exfoliation are usually confined to sheltered positions. There is less skin formation indoors than out, probably due to differences in condensation upon the surfaces of the stones. Contrary to what is sometimes believed, skins are not protective against further action, for they lead to blistering and exfoliation. The causes of exfoliation are not certain, but it is probably due to the difference in volume of the calcium sulphate and carbonate, the difference in thermal expansion, or the action of crystals.

It is stated that the differences in the relative durability of limestones is due to differences in the structure of the stone, and that " the weathering quality of a sample of Portland stone depends largely upon its microporosity and that its durability can be predicted by means of simple laboratory experiments."

The action of the acid gases upon magnesian limestone is similar to that upon the limestones, but the magnesium sulphate is more soluble and is therefore

# USE GAS COKE

## The all-British Smokeless Fuel

Whichever way you look at it, Gas Coke is the most suitable smokeless fuel for modern Commercial and Domestic needs: Gas Coke is *cheap,* having the lowest cost per 1,000 gallons evaporated of any smokeless fuel. It is *clean,* being smokeless and sootless, and it maintains boiler heating surfaces in clean and efficient condition.

Gas Coke will burn in any ordinary type of boiler, without intricate and costly firing apparatus, needing skilled attention. A Coke-fired Boiler is a simple, straightforward, *yet thoroughly flexible* heating unit.

There is a correct grade of Gas Coke for every specific purpose, ensuring the maximum heating efficiency. The fact that Gas Coke is *smokeless* proves its greater heating value, apart from any consideration of Smoke Abatement and the Public Welfare, *for soot and smoke represent wasted heat.*

Gas Coke is made in your own district from British Coal. Buying it, you get the cheapest and most effective smokeless fuel, British or otherwise, and the added satisfaction of helping local industry and local labour. And you are always sure of supplies, at stable prices.

### SEND FOR THE NEW, ILLUSTRATED BROCHURE, CONTAINING INSTRUCTIONS ON THE ART OF SUCCESSFUL BOILER-FIRING

A copy of this Technical Brochure, "Smokeless Gas Coke for Central Heating and Steam-Raising" will be gladly sent free, on application. It gives concrete examples of economies which have been effected through the use of Gas Coke in undertakings ranging from Hospitals to Power Stations. It contains also the reports and statistics of independent tests. Write or 'phone to:

THE LONDON & COUNTIES COKE ASSOCIATION,
9 GROSVENOR GARDENS, S.W.1. VICTORIA 3666.

Or you can apply to THE COAL MERCHANTS' FEDERATION,
7 Victoria Street, S.W.1. - - - - - Victoria 5005.

**Gas Coke is *smokeless,* cheap & clean**

washed away more easily. There are cavities nine inches deep in the magnesian limestone of which York Minster is constructed. Calcareous sandstone consists of grains of sand cemented with calcium carbonate, and are also liable to attack by carbon dioxide and acid sulphur gases. Dolomitic sandstones and slates are also attacked.

Soluble salts, causing floresences, are also agents of decay, and are derived either from the material itself or from external sources, including the atmosphere.

### Preventative Measures.

The chapter devoted to preventative and remedial measures states definitely that it is not possible to recommend any preservative solution except to provide temporary protection in special circumstances. The washing with water of buildings in which the stone is still in comparatively good condition is cheap and effective. The cheapest way of cleaning is by fire hose from the ground, and " where the stone can be scrubbed by hand, as was recently done by H.M. Office of Works at Buckingham Palace, it is probable that washing every five years or so will prove adequate to maintain a good appearance in London." The steam brush is stated to be useful, but alkalies are harmful.

In this connection the Report says : " The oft repeated statement that soot deposits form a protection to the stonework is erroneous."

### Atmospheric Pollution.

The fourteen page appendix on " Atmospheric Pollution in Relation to Weathering," is a useful and concise survey of the nature and effects of coal smoke. It is stated that the principal products of the combustion of coal which are of importance in causing decay of building materials are sulphur dioxide and associated sulphur compounds, carbon dioxide, and soot. " Of these, sulphur compounds are undoubtedly the most important ; soot is also important in that it causes disfiguration, and also because it carries with it deleterious sulphur compounds and brings them into intimate contact with buildings."

Of the soot it is pointed out that the tarry matter content causes it to adhere tenaciously to any material with which it comes into contact. " Hence, in urban districts particularly, much disfiguration of buildings occurs by the accumulation of soot deposits. With many sandstones the soot fills the surface pores and the stone becomes uniformly darkened, but with the limestones a slow erosion occurs in those arears which are exposed to the prevailing winds ; this prevents the retention of the soot, and only the sheltered sides become blackened. Under projecting features there accumulate thick black incrustations which consist of soot and products of the chemical disintegration of the stone."

Analyses of soot and deposit tables, with which our readers will be familiar, are given to show the nature and distribution of atmospheric impurities.

The distribution of the products of combustion are discussed in some detail, and it is stated that their effect is evidenced in country districts far removed from sources of production. Sulphur compounds are more widely distributed than soot. After drawing attention to the observations of the Advisory Committee on Atmospheric Pollution and of Cohen and Ruston in this connection, the statement is made that " Evidence derived from a study of the weathering of building stones also supports the suggestion that sulphur compounds are more widely distributed than soot. It is a matter of common observation that buildings are less disfigured by soot deposits in the country than in towns. They are, then, correspondingly immune from the action of sulphur acids carried by soot, but they are still liable to be attacked by those carried in the gaseous state by the wind. It is not unusual to find limestone buildings in country districts suffering exactly the same kind of decay from the action of acid gases as those in towns. It has been recorded elsewhere that the decay of the limestone in Doulting Church was found to be associated with the presence of considerable amounts of calcium sulphate, although the church is situated at a considerable distance from any large town. Numerous similar examples have been encountered."

The Appendix concludes by a brief note on the influence of the substitution of alternate methods of heating.

A reading of the book makes it clear that while there are many factors contributing to the weathering of building stones, one of the most important—possibly the most important—is the polluted atmosphere. This exposition is of greater value because it is no *ex parte* indictment of the smoke nuisance, but is a scientific examination of the causes and prevention of a serious economic and aesthetic loss. As such it should do much to bring the facts of the situation home to that large body of architects and builders who have hitherto shown a remarkable indifference to what concerns them very closely. The filthy and diseased appearance of our buildings is the most obvious of the numerous consequences of the smoke nuisance, and it is astonishing that we should continue to view them with such bland—or blind—toleration. To destroy an ancient cathedral with bomb or shell in time of war is rightly thought to be an iniquitous thing ; but to destroy it by gradual attrition during the long course of years with sulphur acids and tar laden soot troubles no one. This book, by so thoroughly analysing cause and consequence should do much to dispel this appalling apathy. And in doing this it will strengthen still more the demand for the abatement of coal smoke.

Kempton's

COKE
FIRES

Smokeless
Labour-
Saving
Economical
Attractive.

*Write or Telephone to :-*

**C. H. Kempton & Co. Ltd.**

72, BENNERLEY ROAD,
S.W. 11
BATTERSEA 4991

Head Office :-
STANGATE HOUSE,
WESTMINSTER BRIDGE RD.,
S.E. 1.

# The Use of Gas Coke.

In 1928 an inquiry was made by the Smoke Abatement League of Great Britain into "The Present Position of Solid Smokeless Fuels." A questionaire was framed and submitted to the users of solid smokeless fuels, who were asked to give their opinions on various points connected with the use of the fuels. The analysis of the replies showed that there was a general opinion favourable to the fuels, and showed also the qualities most liked and most criticized. This inquiry dealt almost wholly with the low temperature carbonization fuels, and little information respecting the use of high temperature coke was obtained.

It was thought that it would be of value to make a similar, although more simple, inquiry among the users of a high-quality gas coke; and accordingly a verbal questionnaire has been put to a number of people in the Manchester area who are users of the graded domestic coke supplied by the Manchester Corporation Gas Department at 1s. 5d. per cwt. The questions were put to the residents of different districts—Ancoats, Openshaw, Levenshulme, and Didsbury—in order that all classes of consumer might be equally represented. As the questions were put verbally, during house-to house visits, they had to be simple, easily answered, and few in number. As a rule the questions were introduced in the course of a general conversation about the coke; the principal points being:

1. Its cost compared with coal.
2. Its heating qualities.
3. Its cleanliness in use.
4. The "Cheerfulness" of the fire.
5. The most favoured quality.
6. Any specific criticism.
7. Any other relevant information.

Adequate replies on all, or nearly all, of these points were obtained from sixty-four users. The replies to each question may be summarized as follows:

1. The Cost. 29 considered it to be cheaper than coal, and 7 considered it cheaper when mixed with coal. 10 considered it to be more expensive than coal; and the remainder were either doubtful about the relative cost or did not think it to be cheaper. It is difficult to obtain any satisfactory reply to a question of this type, as few people are able to compare costs. Several, for instance, believed it to be dearer than coal, but used it "to make the coal go further." This can only mean that an economy is made through its use. Others think it "dear" because they are of the opinion that it should be much cheaper because it has had so much taken out of it at the gas works. This fallacy is also found everywhere in connection with the low temperature fuels.

2. Heating Qualities. There was almost a unanimous agreement that coke gave a hotter and more efficient fire than coal. This was the verdict of 58 users; only two stating that its heating qualities were inferior to those of coal.

3. Cleanliness. 37 considered the fuel to be clean in use; many contrasted it favourably with coal. 18 stated that it was dusty or dirty.

4. The "Cheerfulness" of the Fire. 39 liked the type of fire and considered it to be cheerful; 4 liked it only when burning a coal-coke mixture. 5 did not care for the appearance of the fire. "A bright red fire," "cosy in winter," etc., were frequent comments.

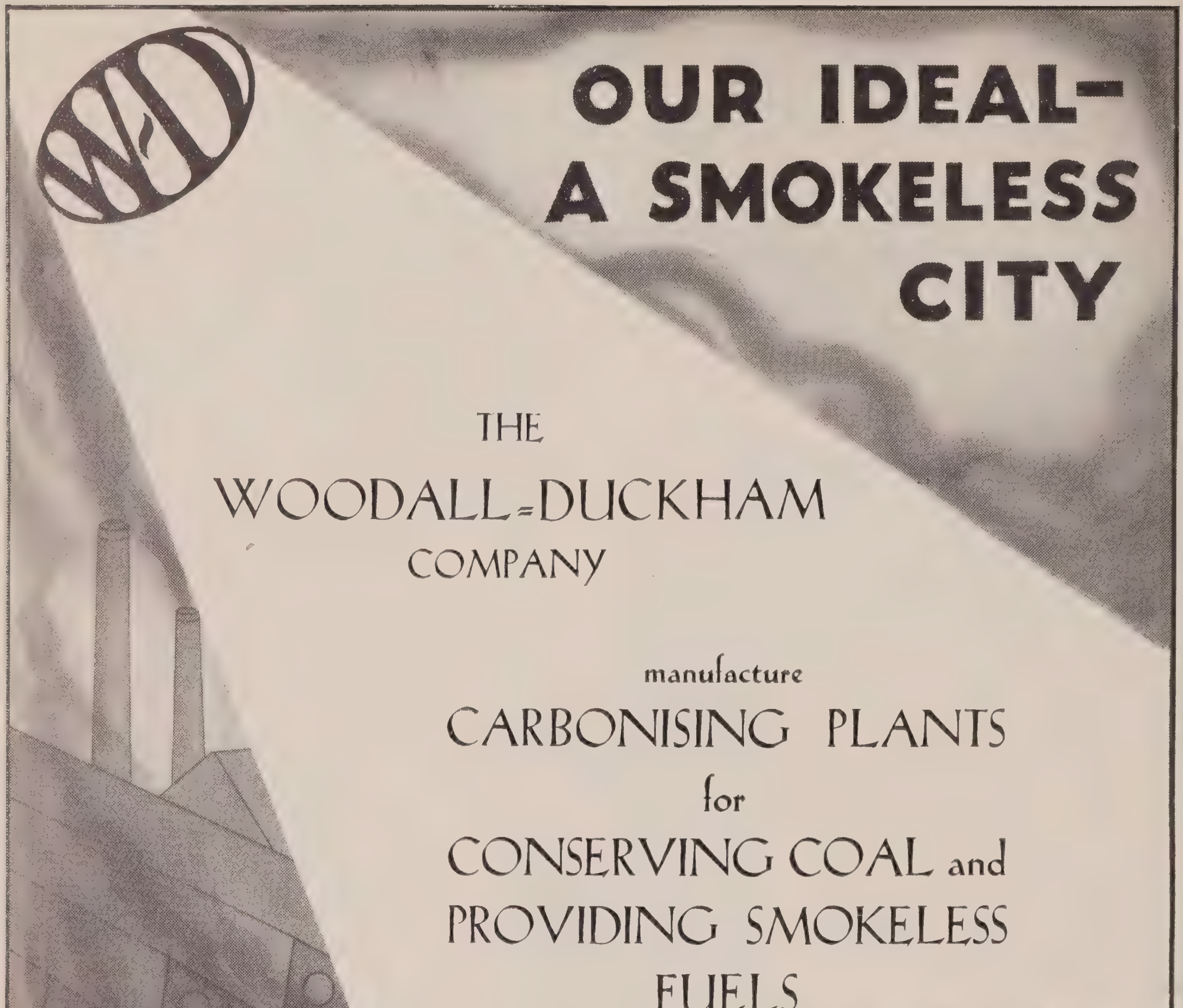
5. The Most Favoured Quality. This question was put in order to ascertain what particular quality in the fuel was considered most highly by the users. The definite replies may be summarized thus :—

| | |
|---|---|
| Heating qualities .. .. .. | 12 |
| No smoke or soot .. .. .. | 9 |
| "Everything in general" .. .. | 6 |
| Lasting power .. .. .. | 3 |
| Price; good (free) burning; cleanliness; cheerfulness; absence of fumes | 2 each |

6. Criticisms. For a similar reason, to ascertain if there was any particular and generally observed fault, a direct question asking for a criticism was made. Of those answering, 19 admitted they had no criticism at all to make, and the remaining replies were as follows:

| | |
|---|---|
| Smell or fumes .. .. .. | 7 |
| Dustiness .. .. .. .. | 6 |
| Price .. .. .. .. .. | 4 |
| Lack of blaze; dislike of smalls; affecting chest; difficulty in obtaining .. .. .. .. .. | 2 each |
| Clogs grate; gives a "dry heat"; slow to start; does not burn away; difficult to light .. .. .. | 1 each |

A rather curious point against the coke was that of one housewife who did not like it because "it looked like cinders."



# OUR IDEAL— A SMOKELESS CITY

THE
WOODALL-DUCKHAM
COMPANY

manufacture
CARBONISING PLANTS
for
CONSERVING COAL and
PROVIDING SMOKELESS
FUELS

THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO.
(1920) LTD., ALLINGTON HOUSE, 136-150 VICTORIA STREET, LONDON, S.W.1

7. OTHER COMMENTS. A number of interesting comments were made without questioning. Several users stressed the value of the coke for heating the oven and boiler. A number declared that they " cannot do without it," one of whom had used coke for 30 years. In one case its use in a bedroom had been condemned by a doctor. One woman uses one bag of coke and one of coal per week, in place of 3 bags of coal previously.

A humorous point emerged at one house : the use of the fuel had been discontinued because the children threw it about the garden.

Although the scope of this inquiry was only small, and the information obtained not of an extensive nature, it is clear from the replies that this particular grade of gas coke is regarded with general approval by those who use it. It was made apparent, and the point must be stressed, that the coke is used by many not alone, but mixed with coal. In nearly every case, it is safe to say, some coal was used for facilitating lighting, even though only coke was used for replenishing the fire during the day.

There was but little heard of the old complaint of fumes and sulphur odours from the coke, although this was met with in one or two cases. The lightness of the ash, causing dustiness, which is a general criticism of carbonized fuels, was met with to a small extent ; but on the whole the cleanliness of the coke was a strong point in its favour.

It should be pointed out that the coke was being burned exclusively on ordinary kitchen and open grates designed for the use of coal. The special coke grates and gaslighters are yet unknown in these districts, and it would be impracticable to consider extending the use of coke by fitting them, superior though they are. Further advance in arear of this type seems to depend upon making the fuel still more freely burning and more easy to ignite.

# Correspondence

*To the Editor, J.N.S.A.S*

SIR,

My attention has been drawn to an abstract of a paper by Mr. V. R. Chadwick (read at a joint meeting of the Institute of Fuel and the Society of Chemical Industry at Bristol, on February of this year, upon which I should like to offer a few comments. The author states " that dense smoke from a boiler chimney does not necessarily represent waste ; but probably indicates efficiency." This is in direct contradiction to the finding of the Government Smoke Abatement Committee, after taking the evidence of a number of witnesses, including stokers. The consensus of opinion was that a boiler when properly fired need not emit dense smoke and that a definite economy would result from complete combustion of the fuel. I have no doubt that firemen find that " their work is easier " when the chimney is smoking ; but it does not seem an adequate reason for polluting the atmosphere. Moreover, because a smokelesss chimney may send out " the real destructive agents, sulphur and chlorine " (by which presumably the author means sulphur dioxide and hydrochloric acid). There is no possible excuse for blotting out the daylight as well by the addition of black smoke. The author's chemistry seems a little at fault in his table of the products of combustion, in which he not only includes oxygen and nitrogen, but states that 88 million tons of industrial coal, when burnt, produce one-third of the weight of combustion products of 37 million tons of domestic coal.

It would be interesting too, to know how he arrives at the number of *cubic yards* of smoke and fumes from industrial and domestic coal and how he has discovered that 37 tons of domestic coal produce 7 million cubic yards, whereas 88 tons of industrial coal give 3 million cubic yards of smoke. It seems unfortunate that at the present time, when the efforts of the National Smoke Abatement Society are being directed towards the diminution of smoke in the interests of health, economy, cleanliness and comfort, that anyone should try to revive the old-fashioned notion that smoke means efficiency.

Yours faithfully,

J. B. COHEN.

---

" Workers at the Chemical Research Laboratory under the Department of Scientific and Industrial Research have found that the most perfect index of atmospheric pollution is the green colour which appears on copper or bronze exposed to the air.

" This colour, which is known as verdigris when it is unwanted and as ' patina ' when the effect is decorative, can now be produced artificially by electricity in fifteen minutes compared with the twenty years which is necessary under natural conditions.

" ' It used to be thought,' said a worker at the laboratory to a representative of the ' Morning Post ' yesterday, ' that this colour was produced by pure air, but we have found that is is almost entirely due to sulphur from city smoke.' "—*Morning Post.*

SIMPLEX

EXTINGUISHERS

SODA, ACID, AND

FOAM TYPE

finest quality-perfection in-operation -- fully approved by all insurance companies - -

MATHER & PLATT Ltd

PARK WORKS ~ MANCHESTER

# The Scottish Branch: Annual Conference.

The Annual Conference of the Scottish Branch of the National Smoke Abatement Society was held in the Burgh Court Hall, Glasgow, on May 5th last, and was attended by over 140 delegates. Several papers of value were read and discussed, and, to a visitor, there seemed to be a more than usually well-informed interest and enthusiasm among those who were present.

The first paper, which provoked an animated discussion, was by Dr. Elizabeth C. Mudie, on the subject of "Maternal Mortality and the Domestic Chimney." After pointing out the continuance of a very high death rate for maternal mortality the speaker developed the thesis that the pregnant woman, under-nourished, lacking sunlight, and psychologically depressed by gloom, has not the forces available to meet the demands of her ordeal, and is thus liable to fall a victim to organisms and consequent puerperal sepsis.

"The lure of the romantic coal fire is so strong as to blind people to the fact that every pennyworth of raw coal burnt in an open grate is going to assist in keeping up the terrible toll of death and disease to which the woman in labour falls the easiest victim . . . . Man, throughout the ages, has always put property before human welfare. He will irradiate his pigs and poultry with expensive ultra-violet apparatus because he knows that they cannot yield him the maximum profit unless bred in conditions in which light plays a part. If babies were saleable commodities, more consideration would be paid to the needs of the mothers that breed them, but they are not."

An address on "Smoke and the Commonweal," was read by Dr. Langrishe in the absence of Professor Lelean. Dr. Langrishe, with the aid of numerous slides, discussed the formation of fog and the influence of smoke upon it; the obstruction of sunlight and ultra-violet radiation; and the general and economic effects of smoke.

The morning session was followed by luncheon in the Banqueting Hall of the City Chambers, where members were the guests of the Corporation of Glasgow. The chair was occupied by Bailie Bell.

The afternoon session was opened by an address from Sir John Stirling-Maxwell, the representative to the Scottish Branch of the Association for the Preservation of Rural Scotland, on the subject of "The Destructive Effect of Smoke on Buildings." He referred to the report on "The Weathering of Natural Building Stones," which is reviewed elsewhere in this issue, and discussed the action of stone upon buildings and its economic consequences.

Following this paper Mr. William Besant addressed the meeting on the subject of "The Effect of a Smoke Laden Atmosphere on Horticulture." This was illustrated by a striking and illuminating exhibition of shrubs and plants taken, for comparison, from the city parks and Loch Lomond Park. The way in which vegetation was affected by soot, oily tar, and sulphur acids was clearly explained. In view of the recent meeting on fumes from road vehicles it is interesting to note that, towards the conclusion of his paper, Mr. Besant said:

"A more recent enemy to plant life in our cities has arrived in the form of motor traction. The deadly carbon monoxide which is emitted from the exhaust of motor-cars must have some effect on vegetation in a city like Glasgow. One has only to note the damage to a hedge, or any other plant which comes into contact with the fumes from a motor exhaust, to realise that here we have another enemy of the city gardener."

On the following day the members and delegates participated in a motor-coach tour, in the course of which it was hoped to observe the actual appearance of the smoke pall over Glasgow. A full report of the proceedings of the Conference has been published by the Branch (Hon. Secretary, Mr. Allan Stevenson, City Chambers, Glasgow).

### The Emission of Fumes.

During the course of a paper on "Pulverized Fuel, with Special Reference to Power Station Practice," Mr. P. B. Jackson, A.M.I.E.E., M.Inst.F. pointed out, after having dealt with the prevention of dust and sulphur emission, that evidences of the stir of the public aesthetic and hygienic conscience show that it continues and seems to increase. There are, he says, two possible solutions to meet the new public demand. One is the installation of apparatus to eliminate the evil and the other is to erect electrical generating stations at points remote from the social centres of activity. Both these alternatives involve additional expense, and the public must now be educated to the fact that in its insistence upon the elimination of these evils it must be prepared to shoulder the financial responsibility involved. Anything which increases the cost of electrical energy is a charge upon the industry, and hence upon the consumer, but it is significant that not all the public are consumers, and the charge is reflected on to consumers only. It must also be remembered that an extension of the use of electricity results in the reduction of domestic and industrial smoke and the total smoke production from all sources is greatly reduced. The attention of organisers of public opinion is, therefore, directed to these important aspects, for operators of electrical undertakings are no more philanthropic than members of other branches of industry, and in this progress towards aesthetic and hygienic satisfaction it is the duty of the public to finance these privileges and comforts of civilization.—*The Electrician.*

NO
SMOKE SOOT
DUST or ASHES

if you let HADENS instal MODERN SYSTEMS for

STEAM RAISING, CENTRAL HEATING,
HOT WATER SUPPLY, VENTILATION,
by
OIL-FIRED BOILERS
ELECTRIC THERMAL STORAGE

Extensive Experience.

Many Installations.

G. N. **HADEN** & SONS
*Estab.* 1816 LIMITED

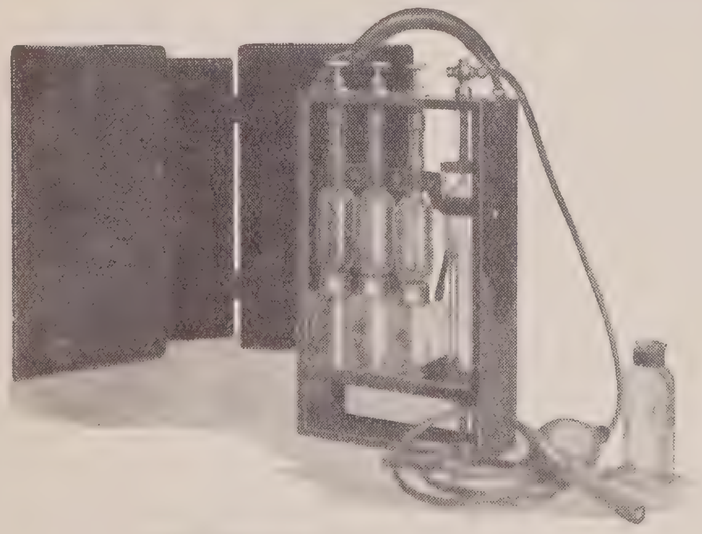
*Heating, Ventilating and Electrical Engineers*

*Works and Head Office*
TROWBRIDGE

*Also at* LONDON, MANCHESTER, BIRMINGHAM, GLASGOW, DUBLIN, LINCOLN, BRISTOL, BOURNEMOUTH, NEWCASTLE, TORQUAY, LIVERPOOL, EASTBOURNE

---

**CO2 TESTS AT THE RATE OF ONE PER MINUTE ! !**



HAYS PORTABLE GAS ANALYSER.

The above analyser is still the most suitable instrument for making rapid, accurate, tests of the CO2 percentage in flue gases. Also deals with Oxygen and Carbon Monoxide.

*Full particulars from the makers*

**DUGUIDS LTD., LYMM, Cheshire**

---

NATIONAL
SMOKE ABATEMENT
SOCIETY

FILL UP THE FORM YOU WILL FIND IN THIS ISSUE **NOW** AND BECOME A MEMBER OF THE SOCIETY & A REGULAR RECIPIENT OF THIS JOURNAL.

THERE'S NO TIME LIKE THE PRESENT !

# Liquid Fuel: An Aid to Smoke Abatement.

*(Contributed)*

The efforts which have been made to awaken the public conscience to the injurious effects of atmospheric pollution upon health and property, have met with some measure of success, but we are still very far from the goal which is within the reach of even the most thickly populated cities if the resources which science and invention have placed at the disposal of the public, were properly utilized. The thick fogs experienced in large cities are conclusive evidence that enormous quantities of solid material are projected into the air from the chimneys both of public buildings and private dwellings. The comparative clearness of the atmosphere over London during the summer months, when the minimum quantity of fuel is being consumed for domestic heating purposes, shows what could be achieved if those fuels only were used which can be completely and scientifically burned.

In residential districts, therefore, the problem of maintaining a clear atmosphere is chiefly a winter one, but in industrial areas where, in normal times, factories work at something approaching full pressure all the year round, the problem is much more difficult. It seems indeed, as if in these areas the pollution of the atmosphere by smoke has come to be accepted as an unavoidable evil—a price which must be paid for industrial activity. In fact a heavy pall of smoke shutting out the sunlight is often regarded as visible evidence of full time operation in the mills and hence of local prosperity. Among industrial areas the Black Country and the Potteries district during busy periods probably furnish the worst examples in this country of the wholesale creation of smoke. This is almost entirely due to uncontrolled combustion conditions and should be entirely obviated by the use of modern methods employing fuels which can be completely and scientifically consumed and cleanly handled.

### Principles of Efficient Combustion.

Atmospheric pollution is generally caused by masses of minute particles of unburned fuel and fine ash from boilers and furnaces being carried up and out of the chimneys to fall on the surrounding district. This condition is quite unnecessary and can be prevented with advantage to the community and financial saving to the user by the obvious expedient of ensuring that all fuel put into the boilers and furnaces shall be completely consumed. This ideal is only attained by the maintenance of a steady flow of fuel and air, in the correct proportions, under all conditions of load.

The undesirable and serious results of badly controlled air supply in a boiler or furnace are perhaps not fully realized by those in charge of steam raising and other installations and unfortunately accurate means of checking the flue temperatures and the $CO_2$ content of the flue gases in order to determine efficiencies are not always available.

Briefly stated, the results of varying proportions of fuel and air are as follows :—

With too little air the fuel is deprived of some of the oxygen necessary for complete combustion with the result that quantities of unburnt or partially consumed fuel are carried up the flue and issue from the chimney in the form of dense black smoke.

Conversely, an excess of air beyond a certain figure not only reduces the initial flame temperature, but increases the weight of exit flue gases and hence the amount of heat lost up the chimney is greatly increased, thus lowering the efficiency of the installation and adding to the fuel bill.

Theoretically, one pound of solid fuel such as coke, needs approximately 10.4 lbs. of air for complete combustion, while a pound of liquid fuel requires 14.4 lbs. In practice, it is not possible to burn a fuel satisfactorily by giving it only the exact amount of air theoretically required to effect complete combustion. The amount of air beyond that theoretically required is known as excess air and the quantity varies with different fuels. Solid fuels usually require at least 50% excess air ; liquid fuel can be satisfactorily and efficiently burned with as little as 20%. Therefore, in order to eliminate smoke and at the same time, ensure highest boiler or furnace efficiency, the minimum excess air figure at varying loads should be accurately determined and once the correct ratio between fuel and air has been obtained, this ratio should be accurately maintained while the plant is in operation.

### Oil—An Ideal Fuel.

From the standpoint of boiler efficiency and cleanliness, oil is an ideal fuel. Quite apart from its uniformity and high heating value, fuel oil has the great advantage over solid fuels that it flows or can be pumped into the boiler or furnace.

In both large and small oil-fired installations, whether under automatic or hand control, manual stoking is entirely eliminated. The oil is delivered through a pipe from the storage tank to the boiler and both its rate of flow and its temperature can be controlled to meet varying demands upon the furnace or boiler. Therefore, no matter at what load the oil-fired boiler may be working, efficient and smokeless combustion is easily maintained. With solid fuel the recharging of the furnace upsets the air adjustments and alters the rate of combustion, causing products to pass into the chimney and to be emitted in the form of dense clouds of smoke. Where liquid fuel is used, the supply of fuel and air is continuous, the burner fitted to the furnace converts the oil into a finely divided spray which ensures complete and efficient combustion. There is no unburned or cold fuel in the furnace to upset combustion conditions ; the oil flame burns at maximum efficiency and without smoke and, moreover, no ash is emitted from the chimney or left in the boiler.

The above remarks apply with even greater force to furnaces employed for metal melting, heat treatment and other industrial processes. Liquid fuel is suitable for nearly all industrial heating operations, because in addition to eliminating smoke and ashes, oil fired furnaces enable the temperature control required in modern industry, to be obtained accurately and cheaply.

While pulverized fuel offers on a limited number of installations a certain amount of control over combustion conditions, it is found in practice that a considerable amount of unconsumed ash passes into the flue and is emitted from the chimney stack to become a serious source of atmoshperic pollution.

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COKE
NATURE HAS HERSELF PROVIDED

ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—
**DOMESTIC HOT WATER BOILERS**
**CENTRAL HEATING**
**OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING**

……

*ENQUIRIES AND DESCRIPTIVE LEAFLETS :—*

**AMALGAMATED ANTHRACITE COLLIERIES LTD.**
120, FENCHURCH STREET,
LONDON, E.C. 3.

## Oil Engines for Power.

Oil offers a satisfactory solution to the problem of producing cheap, clean and flexible power in factories and electric generating stations.

Surprising as it may seem, the steam engine, in spite of its comparative inefficiency, is still a common means of generating power. In small units, in particular, the overall efficiency of the steam engine is very low and, except where large quantities of steam are required and uniform loads can be maintained, the cost of power is relatively high.

The heat losses, and consequent low efficiency of a steam plant, are due to various causes, but we shall mention only those which have a definite bearing on atmospheric pollution.

1. Cost of coal handling.

   The unloading, storing, trucking and final feeding of solid fuel into the boilers add considerably to the cost of steam raising and each one of these operations is responsible for the creation and spreading of coal dust and dirt.

2. Incomplete combustion.

   As already explained, solid fuel is hardly ever completely burned. From the consumer's point of view, this means low overall efficiency and high power costs. From the public standpoint, it means that unburned fuel passes up the flue and is emitted from the stack to fall eventually on the surrounding district.

3. Ash Handling.

   Ashes and clinker are entirely wasteful and ash dust spreads over everything in its proximity and is very destructive. Further, smoking and smouldering ash dumps are a dangerous and most objectionable feature in industrial areas.

Oil, of course, can be and is used successfully on boilers of steam raising plants and its employment eliminates these objectionable and wasteful features, but the use of oil fuel in the boiler cannot overcome the disadvantages and lack of efficiency of the steam engine itself.

To use oil to the best advantage for power generation, it should be burned in the cylinders of the engine. By the installation of internal combustion engines, power can be generated with great flexibility in large and small installations and without the spreading of dirt or other disadvantages unavoidable with steam power plants. The heavy oil engine, gives the highest efficiency which has ever yet been obtained in the development of power under commercial conditions; also the elimination of boilers and chimney stacks, together with the smallness of the power unit and compactness of oil fuel, releases valuable space in the works or factory, which can be used for production purposes.

Heavy oil engines, even of the largest size can be started up almost instantly from cold so that the heavy stand-by losses associated with steam power plants are eliminated. For the above reasons, the heavy oil engine is rapidly replacing the obsolete steam engine as the standard power unit, both in factories producing their own power and in public generating stations.

### Fuel Oil Delivery and Storage.

Oil occupies about one-third the space required for solid fuel of equivalent heating value. The storage of coal in open dumps is not only a cause of deterioration of the fuel, but is the source of much annoyance owing to loose coal dust being carried long distances by the wind. In contrast to this, oil fuel is stored in a closed tank into which it is pumped silently and invisibly from the Oil Company's delivery wagon or rail tank car, thereby dispensing with the dirty and tedious operations generally associated with "coaling."

It will be realized that atmospheric pollution with its deleterious and costly effects upon health and property, is due almost entirely to avoidable waste. Every pound of unburned or incompletely burned fuel which is allowed to escape from the chimney stack represents a definite loss to the consumer. In addition, smoke and other impurities from factory chimneys do incalculable damage to property involving heavy outlay for maintenance, renovation and paintwork.

With oil fuel, controlled and flexible heat and power are obtainable in their cheapest and most convenient forms, there is no waste and where waste of fuel is avoided, the problem of smoke abatement is almost solved.

E. D.

---

## The Annual Conference.

This year's Annual Conference will be held, by the invitation of the Corporation, at Newcastle-upon-Tyne during the week-end September 23rd—25th. An attractive and instructive programme has been arranged, and it is hoped that many members and representatives will attend. The Conference will be opened by the Lord Mayor of Newcastle, Councillor J. G. Nixon, J.P., at a Reception to be held at the Laing Art Gallery, on Friday evening, September 23rd.

On Saturday morning the Annual General Meeting of the Society will take place, and be followed by a paper by Mr. R. A. Mott, M.Sc., F.I.C., of Sheffield University, on "Domestic Smoke Problem: the Possibilities of Coke Oven Fuel." Dr. J. T. Dunn, of Newcastle, will preside. In the afternoon a visit of more than usual interest will be made to the Roman Wall at Borcovicus, with luncheon as the guests of the Corporation, at Chollerford. The customary informal meeting to discuss anything of interest connected with smoke abatement, will be held in the evening.

On Sunday morning papers will be read as follows: (1) "The Psychological Effects of Smoke," by Alderman David Adams, Chairman of the Newcastle Health Committee and a member of the Society's Executive; and, (2) "The Human Factor in Smoke Abatement," by Mr. A. E. Crossley, Chief Smoke Inspector, Manchester. This paper, dealing with the stoker and the work of the smoke inspector, will be of particular value to inspectors. Sir Thomas Oliver will preside.

The Conference headquarters will be the Royal Station Hotel, where special terms have been arranged for those attending the Conference. In consequence of a general wish to have more complete records of the proceedings of the Conferences it has been agreed to increase the usual fee to 10s. 6d. for each member or delegate.

*The* **ADVANCE GUARD** *of*
**HEALTH** *and* **HAPPINESS!**

ELECTRICITY—has banished thousands of air-polluting factory chimneys, and to-day in many districts is rapidly reducing the volumes of domestic smoke.

Interesting leaflets on the application of ELECTRICITY to modern uses will be forwarded post free, on request

*to*

THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.,
15, SAVOY STREET——————STRAND, LONDON, W.C.2.

---

**ELECTRICITY IS THE ENEMY OF SMOKE**

# HODGKINSON'S PATENT AUTOMATIC STOKERS

Are guaranteed to prevent the emission of Smoke and Grits from Industrial Chimneys with the highest Economy and Efficiency and without the use of forced blast Steam Jets.

**JAMES HODGKINSON (SALF'D) LTD.**

**FORD LANE WORKS,**

PENDLETON - MANCHESTER

Telephone :
1491,2,3 Pendleton.

Telegrams :
"Incendo, Manchester."

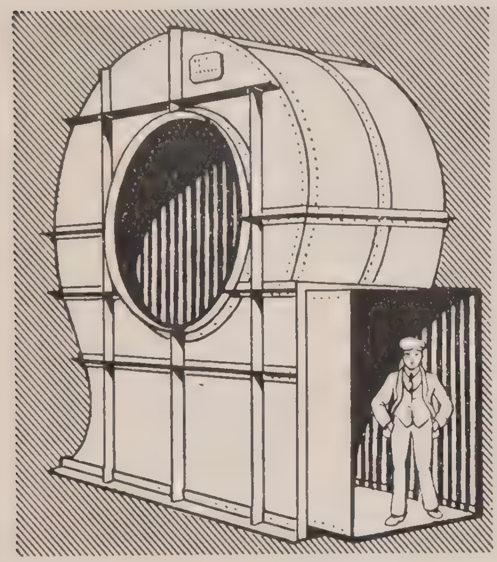
## THE JOURNAL OF THE NATIONAL SMOKE ABATEMENT SOCIETY

is undoubtedly the ideal medium in which to advertise Smokeless Fuels and every appliance or device for minimising or abolishing the smoke nuisance. The advertisement rate is very moderate, while advertisers are assured of **every copy** of the Journal reaching the people who are working for this great modern reform. Smoke Abatement is not a theory ; it is not merely hygienic propaganda. **It is a step forward in the life of the nation.** The movement is making wonderful progress ; it is overcoming all old-fashioned prejudices. Its advance is irresistible. Every engineering firm which produces smoke-abating appliances, and every maker of smokeless fuels, should openly associate themselves with this great national reform, by advertising their products in the **only** National Journal devoted to Smoke Abatement.

Enquiries as to advertisement space should be addressed to the publishers :

THE SERVICE GUILD
**45, Deansgate Arcade, MANCHESTER.**
*Telephone :* BLACKFRIARS **9374.**

# INCREASE YOUR BOILER EFFICIENCY...



The " Cyclone " System of Induced Draught effects a definite saving in Fuel Costs. It spells a double efficiency - a substantial increase of steam power - and the elimination of black smoke.

The low initial cost of installation is an incentive to take advantage of this application to Boiler efficiency of the latest scientific principals. You will find this claim substantiated by the facts set forth in Brochure 66F. Please write for a copy.

- *Write for Brochure 66F.*

**MATTHEWS & YATES LTD**
**SWINTON MANCHESTER**
*London Office :* 20, *Bedford Row, W.C.* 2.

Make your
CENTRAL HEATING
RUN ITSELF!
SET THIS— THATS ALL!

**DOES your Central Heating need constant attention? Is it proving heavy on fuel ......unnecessarily expensive? Install a 'Parwinac' Automatic Oil Burning Heater. Controls Heating at an evenness hitherto unobtainable.**

*Send name and number of present Boiler with Maker's Name and stating electricity available, A.C. or D.C. Ask for List O.B.742*

**Parker, Winder & Achurch, Ltd.**
Broad St. Birmingham

London, 4 Gt. Marlborough St., W.1.
Manchester, 16 John Dalton St. &
also at Leicester and Coventry.

*Parwinac*
**AUTOMATIC**
**OIL BURNING HEATER**

O.B.M.

ECONOMISE FUEL

BY USING THE

SEOTOO
FLUE GAS
CARBURETTOR
In Your
BOILER FURNACES.

SEND ALL PROBLEMS
RELATING TO COMBUSTION
TO

**Smoke Prevention Limited**
1 Victoria St., London. S.W. 1

## CLEANER CITIES

POWELL DUFFRYN SMOKELESS STEAM COALS are unrivalled for EFFICIENCY, ECONOMY and CLEANLINESS.

There is a SMOKELESS COAL for every use :—
Power Stations, Industrial Plants, Institutions, Laundries, Steam Lorries, etc.

P.D. Smokeless Steam Coals have a very low sulphur and ash content, with a high percentage of fixed carbon.

They are eminently suitable for use in modern mechanical stokers.

## BRIGHTER HOMES

PHURNOD SMOKELESS COAL is suitable for all types of domestic hot water boilers, central heating plants, slow combustion stoves, kitcheners, etc.

PHURNOD makes no soot, possesses great heat value, and is the most economical fuel obtainable at its price.

PHURNOD is obtainable in 3 sizes for various requirements :—

No. 1. Cobbles, for horticultural use and the larger central heating plants.

No. 2. Large Nuts, for the larger type of domestic hot water boilers.

No. 3. Small Nuts, for the smaller type of domestic hot water boilers, slow combustion stoves, kitcheners, etc.

*For further particulars apply to :—*

**STEPHENSON CLARKE & ASSOCIATED COMPANIES LIMITED**
4, ST. DUNSTAN'S ALLEY, LONDON, E.C. 3.
And at :—Cardiff, Southampton, Birmingham, Nottingham, Liverpool, Hull, Newcastle-on-Tyne, Glasgow, Belfast.

# BURN CHEAP COAL

## WITH AUTOMATIC CONTROL

**SMOKELESSLY, EFFICIENTLY, ECONOMICALLY**

FOR

## CENTRAL HEATING

IN THE

## PRIOR MASTOKER

*Ask for descriptive Leaflet from*

# SAUNDERS & TAYLOR LTD.

Praed Road, Trafford Park, MANCHESTER.

**Telephone Trafford Park 2007** (3 lines)

---

# OIL OR COAL?

ACCORDING TO CIRCUMSTANCES EACH HAS ADVANTAGES
EACH CAN BE SMOKELESS IF PROPERLY BURNT

THE

**"PRIOR"**
**OIL FIRING SYSTEM**

THE SIMPLEST **OIL** BURNER IN THE WORLD

**Some of its Advantages:**

Low Air Pressure
Gravity Feed for Oil
No Small Jets
No Moving Parts in Burner
Soft Enveloping Flame
Flame Regulation Range 8 to 1
Thermostatic Control optional

*Let us send Particulars.*

THE

**PRIOR**
**MASTOKER**

A FULLY AUTOMATIC
UNDERFEED COAL STOKER
**FOR HEATING and DOMESTIC BOILERS**
*which effects*
A GUARANTEED SAVING of **25%** to **50%** as compared with hand stoking

Under Complete Thermostatic Control

Absolutely Reliable

**We invite you to see it working**

## THE PRIOR OIL BURNER LTD.,

**5 CROWN YARD, STANHOPE ST., LONDON, N.W.1.**

CARDIFF AGENTS—
HAMPTON'S HEATING CO., LTD.,
18 CITY ROAD, CARDIFF.

MASTOKER AGENTS FOR MANCHESTER—
SAUNDERS & TAYLOR, LTD.,
PRAED ROAD, TRAFFORD PARK

# The Journal of the National Smoke Abatement Society

*Editor:* **Arnold Marsh, M.Sc.Tech.**

*Editorial Office:*
**23, King Street**
**Manchester**
**Telephone: Blackfriars 0896.**

*Advertisement Office:*
**The Service Guild**
**45, Deansgate Arcade, Manchester**
**Telephone: Blackfriars 9374**

Vol. 3. No. 12. 1932.

CONTENTS OF AUTUMN ISSUE

| | Page | | Page |
|---|---|---|---|
| The Experts and the Others | 175 | Newcastle | 182 |
| Carbon Monoxide | 177 | Abatement of Smoke from Kilns and Boilers | 182 |
| The Sheffield, Rotherham & District Committee | 181 | | |

*The Journal is open for free discussion of all aspects of the smoke problem, and the opinions expressed in contributed articles are not necessarily the same as the views of the Society. Quotations and abstraction of matter appearing in the Journal is welcomed, provided the usual acknowledgements are made.*

# The Experts and the Others.

A NUMBER of the many newspaper reports of the Conference at Newcastle markedly stressed a sentence in the Annual Report and the additional comment that was made during its reading. It was said that many members of local authorities were apathetic towards the smoke nuisance, and were, indeed, anxious for more smoke in their towns. The comment that was made was to the effect that this fallacy was strong on the north-east coast, and that several authorities had declined the invitation to be represented at the Conference on this account.

The association of smoke with busy factories and prosperity among the uninformed can readily be understood, and that the " where there's muck there's money " school should continue to survive is a sad fact that has to be recognized. It is, however, deplorable that it should still find expression among people, such as some town clerks and responsible members of some town councils, who are, by virtue of their positions, able to influence public opinion against the related movements for smoke abatement and increased fuel economy.

" A smoking chimney shows that a factory is working. Working factories mean prosperity. Therefore smoke means prosperity." This is an expression of the false logic that finds such frequent expression in some quarters. It is reminiscent of the classical statement of the small boy who declared : " Nothing is better than Heaven. Jam tart is better than nothing. Therefore jam tart is better than Heaven."

Even a prominent citizen of the city of Newcastle made the recent visit of the Society the occasion for publicly reiterating this fallacy ; and, in addition to advancing this argument as a reason for not being represented at the Conference, a member of one north-eastern Council observep how difficult it would be for them to treat all smoke-makers exactly alike. Therefore, he concluded, it would be safer for them to leave smoke abatement severely alone.

Such pettifogging notions are really only of small concern, except in so far as they do influence opinion in local circles, and thus retard the growth of awareness of coal smoke and its many evil consequences.

In contrast to these inexpert, and, to be quite frank, ignorant voices, it is pleasant to turn to some paragraphs that appeared in a recent issue of " The Engineer." In a leading article entitled " Compulsion and Progress " the smoke trouble was cited as an example of the fact that an irksome regulation may ultimately be of benefit to that upon which it is imposed. The article says :

". . . . But if we refuse to allow our judgment to be warped by a few selected cases in which restriction and compulsion have done more harm than good, we may find many, even in connection with motor cars, in which, often despite seeming hardship, they have been not only beneficial to the public or to national economy, but have encouraged technical progress. The once deeply resented regulations prohibiting the emission of smoke from factory chimneys may be cited as a case in point. The object aimed at was the purification of the atmosphere, but the reduction of smoke implies better combustion and improvement of boiler firing resulted. The emission of dust and noxious fumes is, we believe, generally controlled by civil process or by individual agreements. But there again boiler engineering will in the long run gain by the compulsion which is put upon it to cleanse the discharge from chimneys. The dust is either unburnt coal or cinders partly composed of incombustible material which should not be there. Hence the prohibition of dust emission will encourage the search for higher furnace efficiency and the use of nothing but clean coal in the pulverizing mills. It is more difficult to see how directly beneficial results can arise from the removal of noxious fumes, but the matter is so new that we would hesitate to regard the regulation as entirely opposed to the interest of the boiler owner. . . ."

A statement of this kind in such an authoritative journal is more than a complete answer to the absurb *dicta* which are to be heard in some of the more gloomy council chambers.

Nor is this an exceptional tribute to smoke abatement. On the contrary, as those more acquainted with the subject are well aware, there is a continuous flow of expert evidence from all manner of responsible speakers and writers, condemning the folly of smoke in no hesitant terms.

But the trouble, of course, is that these critics are never likely to read such journals as " The Engineer." If they had even the slightest amount of technical knowledge, or realized the national importance for the economy and correct utilization of fuel, it is obvious that they would speak rather differently. Or even if they had any inkling of the problems of public health—a subject not altogether unrelated to local government—their opinions would be radically altered. Years ago smoke abatement was the subject of the crank ; to-day it is the subject of the expert—the expert in engineering, fuel technology, and medicine. Its critics are those who, because they talk on all things, understand none.

---

## JOHN W. GRAHAM.

In the recent, and widely regretted death, at Cambridge, of Dr. J. W. Graham, the smoke abatement movement has lost one of its most distinguished workers. Dr. Graham's life was devoted to many important causes, and his reformer's spirit led him to take a vigorous and leading part in the demand for pure air and cleaner cities. Upon the formation of the Smoke Abatement League of Great Britain at Sheffield in 1909, with A. Gordon Harvey, M.P., as President, and Mr. (now Sir) Ernest Simon as the Hon. Secretary, Principal Graham became Chairman, a position which he held until June, 1925.

Dr. Graham was an untiring speaker, writer, and worker, and many enlightening controversies on smoke abatement in the *Manchester Guardian* or elsewhere were the result of his clearly defined and unhesitatingly expressed views. He played an invaluable part in the many years of work that led to the appointment of the Committee on Smoke and Noxious Vapours Abatement, and the passing, in 1926, after many unsuccessful attempts, of the new Public Health (Smoke Abatement) Act.

Upon the formation of the National Smoke Abatement Society in 1929 Dr. Graham became one of its most honoured Vice-Presidents.

This brief notice can be fittingly concluded by a quotation from one of Dr. Graham's many addresses on smoke abatement, which expresses, with characteristic directness, the essential reality of the problem that concerned him so much :

" It is the most curable of our great modern evils. It is not an inbred barbarism like war, not a complicated social disease like poverty, not an appeal to animal passion like drink and other vices. It is an unmixed evil, and its only supports are carelessness and ignorance and the lack of a sufficiently concentrated public opinion. I earnestly commend it to all your chivalrous instincts."

Dr. Graham's life, spent in the service of reform, shows the high measure of chivalrous instincts that a man may possess, and, with great benefit to all, can employ.

# Carbon Monoxide.

The most comprehensive report yet published on the emission of carbon monoxide from motor vehicles and the physiological effects of the gas is the volume entitled "Ventilation of Vehicular Tunnels." This is the Report of the U.S. Bureau of Mines to the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission. As its name implies, it is concerned with an investigation which was carried out in 1921 to ascertain the requirements for the efficient ventilation of vehicular tunnels, with particular reference to the danger arising from the emission of carbon monoxide. The Report is divided into three principal parts :

(*a*) The amount and composition of exhaust gases from motor vehicles in relation to the ventilation of tunnels.

(*b*) The physiological effects of exhaust gases from motor vehicles.

(*c*) Tests conducted in vehicular tunnels in experimental mine.

This question is admittedly a special one, whereas the more general problem is that of the effects of carbon monoxide, etc., in the open street. The emission of the gas and its effects upon the human body are, however, the same, and the report is therefore of great value apart from the issue of tunnel ventilation.

### Summary of Important Results.

An instructive summary of the most important results gained from road tests upon 101 motor vehicles of all kinds is as follows :

1. Automobile exhaust gas consists of carbon dioxide, carbon monoxide, hydrogen, hydrocarbons, oxygen, nitrogen, and water vapour ; the relative proportions of these constituents varying greatly in the exhaust from different motors, depending upon carburettor adjustment, degree of atomization, compression, and other variable factors.

2. The percentage of CO for the majority of cars lies between five and nine per cent. The amount in individual cars varied from 0.5 to 14.0 per cent.

3. The higher percentages of CO are produced when the throttle is nearly closed, as when running down hill or the car standing and engine idling. The largest quantity of CO is produced when the petrol consumption is greatest, as with cars accelerating or running up-hill at maximum speed.

4. Completeness of combustion varies directly as the percentage of Carbon dioxide in the exhaust gas and inversely as the percentage of CO. For the same carburettor adjustment in a given motor, combustion is most complete with the motor operating under full load at normal speed. However, the completeness of combustion of different cars varies greatly under the same condition of test. The primary factor in causing this difference appears to be the carburettor adjustment. The total range for different cars was 50 to 95 per cent.—with result of one individual level test, 100 per cent. and result of majority of level grade tests of this car, 99 per cent. The average for all cars was about 70 per cent.

5. The combustible gas in the average automobile exhaust from one gallon of petrol contains nearly 30 per cent. of the total heat in the original petrol. Careful carburettor adjustment should result in saving half this amount.

6. The great majority of motor cars and lorries are operated on rich mixtures suitable for maximum power, but they are very wasteful from the standpoint of petrol economy.

7. The average motor car carburettor is set for winter operation and is apparently not changed in the summer. This is shown by the higher percentages of carbon monoxide and richer mixtures found in the summer tests.

8. The public should be impressed with the saving of petrol resulting from the use of lean mixtures. The general installation of a small gas sampling tube in the exhaust pipe of motors, especially lorries, by manufacturers would tend to introduce the use of carbon monoxide determinations in controlling carburettor and other adjustments. Large taxicab and carrying companies could well afford to employ a chemist to make regular control tests ; he could save his salary many times over in cutting down petrol consumption.

### The Physiological Effects.

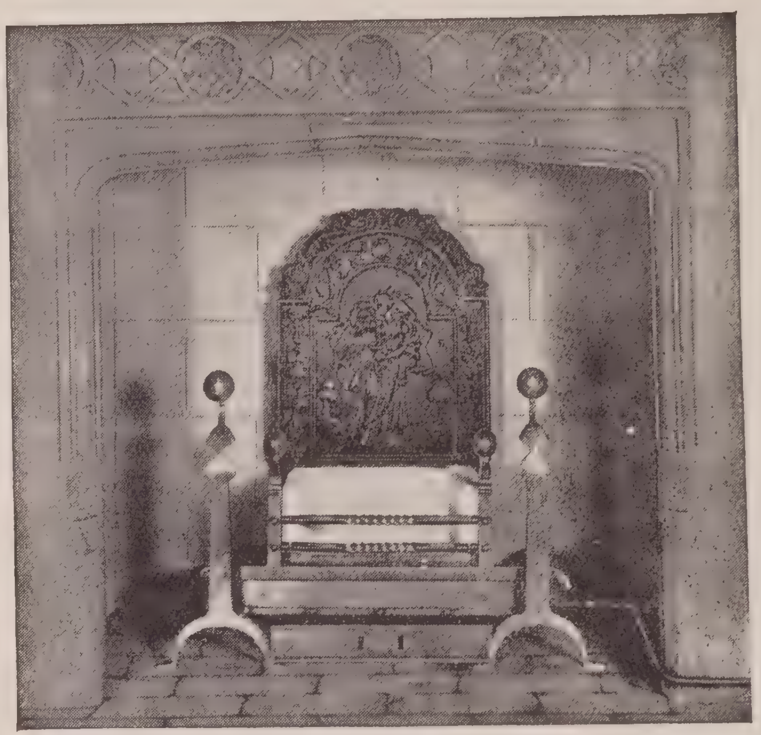
The section upon this, the most important factor calling for complete and detailed knowledge is of especial value. Portions of this part of the Report may with advantage be printed at length :

"Although carbon monoxide is the cause of more deaths than the total due to other gases, it is, apart from a single reaction, a physiologically inert and non-poisonous substance. This reaction is in its combination with haemoglobin, the red colouring matter and oxygen-carrying element of the blood. To whatever extent haemoglobin is so combined it is rendered incapable, until the CO is again displaced, of transporting oxygen from the lungs to the tissues and organs of the body.

It is highly probable that all of the results of inhalation of CO are due directly or indirectly to oxygen deficiency. Even when as in fumes from explosives, and other incomplete combustion, other toxic substances are present, CO is usually the chief cause of injury or death. The body of an adult man of average weight contains

HOUSEWIVES recommend the "Metro" open smokeless coke fire because it saves the Work of fire-making and hearth cleaning. Burns brightly without attention for three to four hours and is cheaper in use than a coal fire.

Every "Metro" coke fire in use helps to reduce the smoke pall which brings destruction and disease in its train.

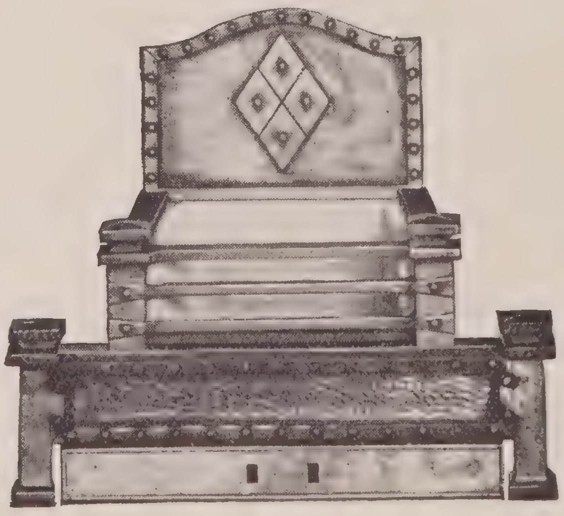


# THE "METRO" COKE FIRE

## Smokeless and Economical

The "Metro" Coke Fire Inset type has been designed specially to fit into existing fireplaces and are also obtainable in a series of charming Basket and Dog Grates as illustrated, these models combine all the beauty of the old world open hearth and Fire with the cleanliness of the modern Coke Fire.

Write for illustrated list of all types of Metro Coke Fires to Sidney Flavel & Co., Ltd., Leamington.



**FLAVELS**
**of LEAMINGTON**

who manufacture and distribute the Metro Coke
Fire for the South Metropolitan Gas Co.

enough haemoglobin to hold about 600 cc. of oxygen. If completely saturated it would hold the same amount of CO, 1 molecule of CO replacing 1 molecule of oxygen in the blood. The adsorption of 6 cc. of CO from the lungs produces, then, 1 per cent. of saturation, and 0.6 cc. abolishes 1/1000 or 0.1 per cent. of the oxygen capacity. A fairly vigorous man breathes about 8 litres of air a minute when sitting at rest, and roughly twice as much when walking at a good pace, or three times as much when hurrying, carrying a moderate load, or working at a rate that he can maintain for a considerable time. About 25 per cent. of each breath merely enters his respiratory dead space, the mouth, nose, wind-pipe, etc.; and 75 per cent., or about 6,000 cc. of air a minute, when the subject is sitting at rest, enters the lungs.

The unit in which various concentrations of CO are commonly measured and expressed for purposes of ventilation, is one part or a certain number of parts of this gas mixed with 10,000 times as much air. A part is 0.01 per cent. of an atmosphere. Now, 0.01 per cent. of 6,000 cc. (the volume of air entering the lungs in a minute) is 0.6 cc., and this in turn is 0.1 per cent. of 600 cc., the body's oxygen capacity.

Evidently, then, if all the CO entering the lungs were to be absorbed, the blood would become saturated at the rate of 0.1 per cent. per minute, or 1.0 per cent. every ten minutes, per part of CO in the air.

" The reaction of haemoglobin with CO is more intense than with oxygen; and, as CO is not consumed in the tissues, it can be eliminated from the blood only through the mass action of oxygen in the lungs. It is quite eronneous to think that CO causes directly any change in the blood other than a temporary replacement of oxygen, and consequent asphyxia. It acts in a manner altogether different from the irritant and corrosive gases employed in the World War. It merely displaces and temporarily excludes from the blood up to a point depending upon the relative amounts of CO and oxygen in the air breathed and the duration of exposure, but if thereafter the pressure of oxygen is high enough and that of CO is low, or absent as in pure air, oxygen can likewise displace CO and thus completely restore the oxygen-carrying power of the haemoglobin. The amount of haemoglobin combined with each gas when air containing CO is breathed for a long time is merely the expression of the equilibrium between forces which are the tensions (partial pressures) of each gas in the air of the lungs and the chemical attraction of haemoglobin for each."

" Haemoglobin attracts CO about 300 times as strongly as it does oxygen. When blood is exposed for a sufficiently long time to an atmosphere containing a certain amount of oxygen, say 21 per cent. of an atmosphere as in air, and 1/300 as much CO, diffusions and the mass actions of the two gases bring about a condition of equilibrium, in which 50 per cent. of the haemoglobin is combined with oxygen and 50 per cent. with CO . . . ."

Tests carried out in a small gassing chamber into which CO was gradually introduced showed that no one had an appreciable degree of headache after a period of one hour in the chamber with four parts of CO or less. With six parts the degree of effect, if any, was usually very slight. With eight parts there was decided discomfort for some hours, although not enough to interfere with efficient work in the laboratory or at the desk. After an hour in ten parts, even an unusually resistant subject was rather miserable and averse to work for five or six hours, and could still recognize the effects after 12 hours.

**Tunnel Tests.**

In a further series of tests in an experimental tunnel, CO samples were taken in the tunnel and in a car, and physiological data obtained from the staff engaged in the experiments—drivers, samplers, and observers. The saturation of the blood with CO was measured, the body temperature and pulse taken, and various symptoms observed. The complete table of results is highly instructive, but for the present summary it will be sufficient to indicate the observations made during the test in which the CO reached the highest concentration of any. In this, as will be seen, the danger mark was passed.

The details are as follows:

| | | |
|---|---|---|
| Duration of Test | .. .. .. .. | 1½ hours |
| CO parts per 10,000. | Tunnel section avg. .. | 8.1 |
| | Car sample avg. .. | 8.8 |
| CO saturation of blood, avg. all men .. | .. | 29.4 |
| Body temperature rise .. | .. .. .. | 1.0° |
| Pulse increase .. | .. .. .. .. | 28 |

The symptoms observed may be tabulated thus:

| | Drivers | Samplers | Observers |
|---|---|---|---|
| Number .. .. | 4 | 4 | 3 |
| Eyestrain .. .. | 1 | 0 | 0 |
| Eye irritation .. | 3 | 1 | 2 |
| Headache .. .. | 4 | 4 | 3 |
| Dizziness .. .. | 2 | 2 | 0 |
| Drowsiness .. | 1 | 0 | 1 |
| Nausea .. .. | 4 | 3 | 2 |
| Collapse .. .. | 1 | 0 | 3 |

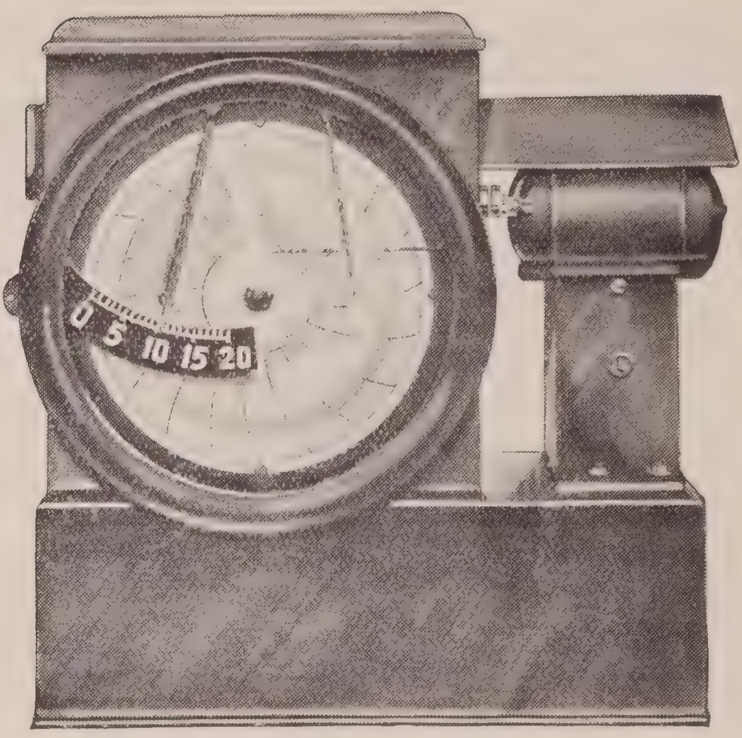
| | |
|---|---|
| Men having symptoms due to CO | 11 |
| Men not O.K. after 24 hours .. | 6 |

These extracts from this Report are given in some detail as the publication is not generally available for reference in this country, and the information may be of value to those who are interesting themselves in the study of the problem as it exists, to a degree not yet fully determined, on the highways and in the city streets of this country.

# "THE PRIMARY SOURCE OF LOSS IN A STEAM PLANT IS AT THE FURNACE"

## This instrument measures the efficiency of your fuel . . . .

## Your FUEL BILLS show the penalty of inefficiency



In the headlines above . . . in a dozen words . . . is revealed the essence of efficient Boiler practice. The prominent Authority who makes this statement continues: "*The highest efficiency is secured when one lb. of fuel is completely combusted by an amount of air of the exact weight to complete the exact chemical combination.*" Or more briefly, the ideal is to maintain a *maximum* of $CO_2$ in the flue gases by using a *minimum* excess of air.

Here you have the theory in the simplest possible terms. And *theory* may or may not interest the "practical" man, or the man who *pays* the fuel bills. But in effect it amounts to this, amongst other things: that unsuitable fuel causes inefficiency, and inefficiency means *loss*, and more particularly loss of money.

There is no other smokeless fuel which gives the same effective heating value as Gas Coke. This has been *proved* on independent boiler tests on commercial plants where net efficiencies up to 86% have been obtained; and in ordinary working practice at many different undertakings — Laundries, Hospitals, Municipal Buildings, etc. — some of which have saved from 25% to 50% on their fuel bills through changing over to Gas Coke.

If you are not satisfied that you are getting the most out of your steam plant or furnace, our Technical Adviser will personally investigate your special needs. If it is possible to save money in your working or to get greater efficiency, he will advise you how to go about it, freely and without obligation.

### SEND FOR THIS ILLUSTRATED BROCHURE, ON THE ART OF SUCCESSFUL BOILER-FIRING

A copy of this Technical Brochure, "Smokeless Gas Coke for Central Heating and Steam Raising," will be gladly sent free, on application. It gives concrete examples of economies which have been effected through the use of Gas Coke; and independent tests. Write or 'phone to:

THE LONDON & COUNTIES COKE ASSOCIATION,
9 GROSVENOR GARDENS, S.W.1 VICTORIA 3666.

Or you can apply to THE COAL MERCHANTS' FEDERATION,
7 Victoria Street, S.W.1 - - - - - Victoria 5005.

## GAS COKE is the cheapest and most effective smokeless fuel

# The Sheffield, Rotherham and District Committee.

The second annual report of this, the first, and, to the present, the only statutory committee, is naturally an interesting document, especially in the light of the controversy upon such committees. Sheffield and Rotherham, Stockbridge, Rawmarsh, and Greasborough U.D.C.'s, and Rotherham R.D.C. are the six authorities constituting the committee, and together form one of the most serious smoke-producing areas in the country.

It is interesting, first of all, to turn to the income and expenditure account, from which it is seen that the total expenditure for the year (ended March 31st, 1932) is £1,781. As the first year's operations resulted in a surplus, the contributions from the constituent authorities were lowered, and, while Sheffield's quota was £887, it is of interest to note that Stocksbridge and Greasborough contributed only £11 and £4 10s. respectively —extremely low cost for specialized smoke inspection, which in these areas, during the year, amounted to 341 and 101 chimneys observed.

Efforts have been made to induce two further R.D. authorities, which lie within the main area of the committee, to join ; but so far without success. It is stated, however, that "it is not intended to let the matter rest."

The method of approach adopted by the smoke inspectors is shown by the fact that only five prosecutions, three with respect to boiler chimneys and two with respect to steam wagons, with four Magistrates' Orders, were obtained during the year ; whereas 85 notices and 360 intimations were served, and 660 advisory visits were made.

No less than 6,296 chimneys were observed during the year, from which the average smoke emission was 3.3 minutes per hour.

**Atmospheric Pollution.**

The Committee supervizes the deposit gauges and U.V. radiation tubes in the district. An instrument for the determination of sulphur dioxide in the atmosphere has also been installed in Sheffield ; and it has been found that the acidity of the atmosphere varies inversely with wind velocity, and that abnormal deposits occur during fog and heavy humid atmospheric periods.

The important question of instruction classes for firemen has been considered, and the matter is to be brought up at the Joint Advisory Committee, which comprises representatives of the Smoke Abatement and the Sheffield and District Manufacturers' Committees.

The report of the Chief Inspector (Mr. James Law) considers the problems due to smoke from different sources in the area—boiler smoke, metallurgical process smoke, smoke from combination chimneys (steam-raising and furnace work) and from coke-oven plants.

The metallurgical processes are, of course, the principal smoke producers, and, it is stated, "there are a considerable number of furnaces which are working in the area, which are so badly constructed that they offend every law of combustion, and in their present state will never be anything better than 'smoke makers.'"

Re-construction is essential, and is now in the first stage of work. This may be achieved, continues the report, either by means of controlled furnaces using solid fuel or by specially designed gas-fired furnaces.

Many conversions have already taken place—26 in Sheffield, and 48 in Rotherham during the year. Thus Rotherham, especially in relation to their respective sizes, is making much better progress than Sheffield.

The financial position of the Committee seems to be excellent, and should do much to satisfy local authorities in other areas which have been considering the formation of other committees. The details of the work done ; the cordial relations, through the medium of the Joint Advisory Committee, with the manufacturers ; the development of research work and pollution observations ; and various other useful activities, show clearly the value of co-ordinated and rationalized effort in place of disconnected individual action at different standards. The theory of the regional statutory committee has been, and continues to be, a matter of some dispute ; the success of the one practical example cannot fail to do much in convincing all who consider the question from an unbiassed standpoint.

---

The Sanitary Inspector's Report for Billingham and District states that the smoke nuisance in the area practically consists of the emission of grit from pulverized fuel, fumes from chemical works, and dust from cement works. During the year the nuisance from grit and cement dust has not been very serious, and there is little doubt that the measures taken by the responsible firms to abate the nuisance from these sources have been largely successful.

A new series of classes for boilermen has been started in Manchester in conjunction with the Manchester College of Technology and the Manchester and District Regional Smoke Abatement Committee. This is in addition to the usual courses which have been held for many years on the management of steam boilers. Mr. S. M. Duguid, a member of the Society, is in charge of the course.

# Newcastle.

A hundred members and delegates attended the fourth Annual Conference of the Society in Newcastle-upon-Tyne in September, and it was generally agreed that this was the most useful and enjoyable of the series. Not only were the papers excellent and the discussions upon them of real value, but the hospitality of the Newcastle authorities was such that every visitor must have conceived a considerable and lasting regard for the city and its people.

The Reception on the Friday evening, among the notable pictures of Newcastle's Art Gallery, was, to begin with, a social event that everyone enjoyed and not merely endured. The visit to the Roman Wall at Borcovicus on the following afternoon, with a delightful luncheon at the inn at Chollerford (which was enlivened by speeches of delicately-barbed wit by the Lord Mayor and the President) was a memorable occasion for most of the members. Not only were the Roman ruins and the Wall objects of an interest rarely to be found in the midst of a smoke abatement conference, but the magnificent open country, sun-lit and fresh, was a tonic of great potency after the morning's earnest deliberations.

On Sunday, too, the tour of the coast, with tea at Whitley Bay, and a breezy walk along the long harbour wall at Tynemouth, made a highly enjoyable afternoon.

The papers, which, with the discussions, will be printed shortly in a separate volume as the Proceedings of the Conference, speak for themselves. Each dealt with different, but euqally important, aspects of the smoke problem, and our grateful thanks are due to Alderman Adams and Messrs. Mott and Crossley for their contributions to the success of the meetings.

It may interest those who were present to learn that the Conference was reported and commented upon in the Press much more than any previous occasion. Over 200 cuttings have been received at the time of writing, and many of these are long and full accounts of the proceedings ; and to this must be added several announcements and news reports from the B.B.C. It will be seen that the real good achieved by the Conference extends far beyond the walls of the meeting room and the hundred delegates.

# Abatement of Smoke from Kilns and Boilers.

BY ALFRED B. SEARLE, CONSULTANT.

*A Paper read before the Stourbridge and Manchester Branches of the N.A.C.M.*

In the manufacture of bricks, roofing tiles, floor tile, terra-cotta, and most unglazed articles made of clay, the production of smoke is due to :

(i.) A Steam-Navvy, if one is used in the clay pit.

(ii.) The boiler used for driving a steam-driven plant (if such a plant is used).

(iii.) The fires in a dryer, if a direct-heated dryer is used, and

(iv.) The kiln or kilns.

Boilers of a portable type, such as are used on steam navvies, can seldom be provided with any satisfactory means of abating the smoke they produce. If objection is raised to such smoke, the only course is to replace the steam-navvy by one driven by oil or electricity.

The Boiler used for driving the Plant, and usually for heating the dryer, is generally of the Lancashire type. There are several methods of reducing, or even of preventing, the emission of smoke from such a boiler. Some of these devices are good, others are almost useless ; some are cheap and good, whilst others are costly and inefficient. The brick manufacturer has an abundance of patterns from which to choose, and is puzzled to know which to select.

**Underlying Principles.**

He will find his choice greatly simplified if he bears in mind the fundamental principles underlying all smoke-preventing devices. They are these :—

(*a*) When coal is burned it evolves a large volum of gas, tar and smoke.

(*b*) The gas and tar when heated sufficiently decompose, forming more smoke.

(*c*) Smokeless combustion can only proceed efficiently when the particles to be burned are mixed with an abundant supply of air at a suitable temperature, *before* the particles are hot enough to be decomposed.

(*d*) When smoke has once been formed it is extremely difficult to burn it efficiently. It is far better to prevent its formation where possible.

(*e*) Three-quarters of the substances contained in coal will burn without any smoke, so that appliances for smoke-prevention may be concentrated on dealing with a relatively small proportion of the coal—namely, the volatile matter.

(*f*) When the volatile matter has been driven off there is no risk of smoke. For this reason *coke* cannot smoke.

In some localities where coke is cheap, it pays to use coke instead of coal in the boilers. In most brickworks, however, coke is regarded as too costly.

(*g*) If the volatile matter from coal can be mixed with sufficient air at a suitable temperature, and at a sufficiently early stage, it will burn completely without smoke.

**Applying Principles to Practice.**

In an ordinary Lancashire boiler, the coal is burned on a grate by means of air, which rises through the bars and fuel.

**COKE FIRES**

**Smokeless**
**Labour-**
**Saving**
**Economical**
**Attractive.**

*Write or Telephone to :-*

**C. H. Kempton & Co. Ltd.**

72, BENNERLEY ROAD,
S.W. 11

BATTERSEA 4991

Head Office :-

STANGATE HOUSE,
WESTMINSTER BRIDGE RD.,
S.E. 1.

THE
WOODALL-DUCKHAM
COMPANY

manufacture
CARBONISING PLANTS
for
CONSERVING COAL and
PROVIDING SMOKELESS
FUELS

THE WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO.
(1920) LTD., ALLINGTON HOUSE, 136-150 VICTORIA STREET, LONDON, S.W.1

The first thing which occurs when a fresh charge of fuel is placed on the fire, is that the moisture and volatile matter are driven off by the heat of the fire. There is a violent rush of tarry vapours, gas, and smoke, which requires 8-12 cub. ft. of air for each pound of volatile matter in the fuel, and to mix these completely before they can burn properly, is a very difficult matter.

The only air ordinarily available, however, is that which enters between the bars, and most of this is used by the glowing coke. The inevitable result is the emission of smoke.

If the shape of a boiler-furnace were different, so that there could be a bed of fuel 6ft. deep, the emission of smoke would be much less, because it would be emitted far more slowly, and could be easily treated. The furnace, would, in fact, be converted into a gas-producer, the gas from which would burn without any smoke.

This alteration in the shape of the boiler being impracticable, other means must be found. The best known are :

(i.) To supply the fuel continuously by mechanical means, in very small quantities at a time, instead of suddenly every half hour. This greatly reduces the amount of smoke, but it is not always able to prevent its emission.

(ii.) To supply an ample volume of air in such a manner that it mixes very completely with the volatile matter from the coal. This is a difficult matter in an ordinary hand-fired boiler, as the volume of air required after a fresh stoking is enormous. It is much easier to supply it with a mechanically-fired boiler, as the supply of fuel and air are then both continuous.

One of the most popular methods with hand-fired boilers, is to admit a large volume of air at or near the " bridge " of the furnace, *i.e.*, at the back of the fire. Theoretically, this is a bad arrangement, because it allows the volatile matter to become overheated before being mixed with air. Yet the numerous forms in which this device is used show not only its popularity but its general effectiveness.

A method which is much sounder theoretically, but does not provide any opportunity for selling any device, is to make a number of holes each 1/8in. diameter, in the front of the furnace, so as to admit tiny streams of air. The ten or twenty larger holes in the doors of some boilers, do not serve the same purpose, for they do not admit sufficient air, nor do they divide it into sufficiently small streams. As it has not been to the financial interest of anyone to " push " this simple device, it has largely fallen into disuse—not because of its lack of value, but simply because no one gains anything by recommending it !

With a mechanical method of feeding the boiler continuously with fuel, and some means for supplying the requisite amount of air *above* the grate bars, to mix with and burn the volatile matter, there need be no emission of black smoke from a Lancashire boiler in normal working order.

Smoke abatement orders for boilers create no real hardship, beyond compelling the owners of the boilers to instal a suitable device for supplying the requisite amount of air to burn the volatile matter.

There are elaborate devices for dealing with smoke and grit emitted by boiler chimneys, but these are not suitable for brickworks, and need not be considered.

**Smoke Emitted from Dryers.**

Most dryers in brick and tile works are heated by steam, and so do not produce smoke apart from the boiler. Where the dryers are heated by fires beneath the floor, or in a separate air-heating furnace, the conditions are similar to those in a boiler.

The simplest method is to use coke, which produces no smoke, or to use a single fire-place with a fuel-bed 6ft. deep—in other words, a gas producer, and to heat the dryers with the gas so produced. This is by no means easy, as the gas is difficult to burn unless it is supplied with heated air at a suitable temperature.

Some dryers are heated by waste gases from the kiln ; these dryers may emit smoke which originates in the kiln.

*Burning the Bricks* uses half to two-thirds of the total fuel-consumption of most brickworks.

The purpose of burning is to convert the easily damaged bricks into those of a hard, stone-like nature. It does this by bringing about a series of highly complex chemical and physical changes, each of which must be carried to the desired point, and then stopped, as a continuance would spoil the bricks for their intended purpose. In other words, the control of the burning of bricks is the control of a series of complex reactions which must be " arrested " at a suitable stage or the results will be disastrous.

So far as smoke-production is concerned, only two of these reactions need be considered separately :

(i.) Many clays, shales, etc., used for brickmaking contain *carbonaceous matter* in a form which cannot be removed prior to burning the bricks. This carbonaceous matter is present in very variable proportions in different materials. In some it is greater than is required to burn the bricks if it could be separated and used as fuel.

Such carbonaceous matter, when present, makes the burning of the bricks very difficult, as it tends to serious local overheating and the production of black hearts or cores in the bricks. In all cases where it occurs, the burning of the kiln must be made subservient to " burning out " this material under conditions where it will do no harm and regardless of the fact that its heating value is largely wasted, or that smoke is produced.

Without going into minute details, it may be taken for granted that to burn any kiln filled with bricks containing much carbonaceous matter and yet to avoid producing smoke for more than the periods prescribed in the proposed by-laws is quite impracticable.

This subject has been particularly thoroughly investigated in a proper scientific manner, not so much to prevent smoke as to find a means for making full use of the heating value of the carbonaceous matter and of the fuel. With certain clays and shales the difficulty is far less than with others, but for most brickmaking materials no certain means of preventing the emission of black smoke for long periods has yet been found.

The best that can be done is to allow the carbonaceous matter to burn away at such a rate that it does no harm to the bricks. It must not burn away too slowly or the bricks would be spoiled in one way, nor too rapidly or they would be spoiled in another way.

(ii.) The second important reaction so far as smoke production is concerned is the *reduction of the iron compounds* in the bricks. This is essential if certain shades of colour are required (as in multi-coloured bricks and blue engineering bricks) and also if certain other kinds of bricks of great strength are required. It is of less importance in most red building bricks.

It is almost impossible to effect this reduction without producing smoke and it is quite impossible to do so when making " blue bricks."

As blue bricks and some others depend for their strength on the controlled reduction of the iron compounds and on the chemical reactions which follow such reduction, the production of smoke appears to be

# SIMPLEX

## EXTINGUISHERS

SODA, ACID, AND

FOAM TYPE

finest quality-
perfection in-
operation - -
fully approved
by all insurance
companies - - -

**MATHER & PLATT Ltd**
PARK WORKS ~ MANCHESTER

inevitable where such bricks are produced. Many attempts have been made to produce the same results in gas-fired (smokeless) kilns, but so far they have failed on a large scale. On a semi-commercial scale, promising results have been obtained, so that some means of ensuring the desired reactions without smoke may be found in the future ; at present, it is commercially impracticable.

### Production of Smoke in Burning.

In studying the production of smoke in the burning of bricks, the following facts appear, regardless of the kind of kiln used :

(*a*) Most clays and shales used in the brick-making industry contain a variable proportion of carbonaceous matter, the controlled removal of which is essential, regardless of the smoke involved.

(*b*) For "multi-coloured," "blue" and some other engineering bricks, the reduction of the iron compounds in the bricks is essential. This requires a long time—sometimes 72 hours—and is invariably accompanied by smoke ; without smoke it cannot be accomplished satisfactorily on a commercial scale.

(*c*) Most coal-fired kilns inevitably produce smoke no matter how skilfully they are controlled.

In order to appreciate this last fact, the various kinds of kilns must be briefly considered. In this connection it is important to remember that there are many kinds of kilns in use at the present time. It is. therefore, necessary to classify them. The following classification is convenient :—

1 (*a*) *Clamps.*—Bricks made of clay mixed with coal, coke, or cinders (with or without other materials) are stacked in a special manner in the open air and "set on fire." The "structure" is known as a clamp. No kiln is used.

Clamp bricks are made in enormous quantities—many millions a year in the south and south-eastern counties—but in the Midlands this method is only used very occasionally, as when a new works is being started and bricks are required to build the kilns and other structures.

Such a method of burning produces a variable amount of smoke—usually with a peculiarly unpleasant odour.

The bricks, during the burning, are not enclosed in any klin or other structure and control of the smoke is quite impossible. If smoke is not to be produced, this method of manufacture would have to be abandoned.

1 (*b*) The term "Clamp" is often used in the Midlands for an up-draught kiln (described later). Bricks burned in up-draught kilns have no fuel mixed with the clay. It is, therefore, necessary to be clear as to which kind of clamp is intended.

2. *Up-draught kilns* consist of a circular or rectangular structure, built of bricks, with fire-places in its walls. The top of the kiln is quite open, though a light wooden roof is sometimes erected some distance above it.

In an up-draught kiln the gasses, flames and smoke pass into the kiln, distribute themselves among the bricks, and then rise and pass out through the top.

The production of smoke is inevitable, as the fire-places are too small to enable smoke-preventers to be used, a long-flamed fuel is essential, and the impinging of the hot flames, rich in hydrocarbon vapours, on the cooler bricks necessarily causes both soot and smoke to form and to continue to form for 48-72 hours. As the bricks inside the kiln become red hot, the smoke is reduced in quantity, but seldom ceases before the kiln is finished.

I cannot conceive any means whereby smoke can be prevented in this kind of kiln, as all the conditions are precisely those which favour its formation during a large part of the burning.

### Down-Draught Kiln.

3. *Down-draught kilns* are circular or rectangular brickwork structures, with a domed or arched roof (known as the crown) and one or more chimneys. The fuel is burned in fireplaces in the walls of the kiln and the hot gases, flames and smoke pass up a series of vertical flues (known as "bags"), strike against the crown, and are deflected downwards in parallel lines to the floor. They then pass through the floor into flues which lead to one or more chimneys according to the design of the kiln.

The same conditions—favourable to the production of smoke—occur as in up-draught kilns, though combustion is rather more perfect and the distribution of the heat is more uniform.

In burning bricks in a down-draught kiln, great care is necessary to raise the whole of the contents to the maximum temperature without overheating those nearest the top.

These topmost bricks receive the heat first and various methods are used to prevent overheating them whilst heating the lower bricks.

One of these methods, which may be taken as typical of others, is known as "heating in waves." It consists in fillng a deep firebox and the space above it with fuel. As the fuel burns away, air enters above it and gradually increases in volume until the fire-place is re-filled with fuel.

In the first stage, the heat from the fuel heats the top bricks intensely. In the next stage, the air entering the kiln, with some heat from the fuel, cools the upper bricks and carries it down, heating the bricks below. This alternation of "stoking" and "waiting" produces alternate heating and cooling of the topmost bricks and the gradual raising of the remaining bricks to the required temperature.

Each time the fire-places are filled with coal, smoke is necessarily produced because there is a shortage of air. This is a necessary accompaniment of the formation of hydrocarbon vapours which are required to carry the flames well down into the lower part of the kiln and the absence of such vapours in "clean" producer gas makes its use unsuitable for such kilns.

Down-draught kilns are regarded as the best for producing bricks of the best quality for facing buildings and the most beautiful bricks are produced in them.

I know of no practicable means of making them smokeless, as when the gases are taken under hot-floor dryers they still emit smoke when discharged from the dryers. Moreover, some works using down-draught kilns could not make use of the waste heat in this manner.

Down-draught kilns are sometimes connected in series, the gases from one being led through others in succession. This reduces the amount of smoke discharged into the atmosphere, but it does not eliminate it. The connection of kilns in this manner has several serious objections and it is seldom applicable to existing kilns. It cannot, therefore, be regarded as a means of preventing smoke.

NO

SMOKE SOOT
DUST or ASHES

if you let HADENS instal MODERN SYSTEMS for

STEAM RAISING, CENTRAL HEATING,
HOT WATER SUPPLY, VENTILATION,
by
OIL-FIRED BOILERS
ELECTRIC THERMAL STORAGE

Extensive Experience.

Many Installations.

G. N.
*Estab.* 1816

**HADEN**

& SONS
LIMITED

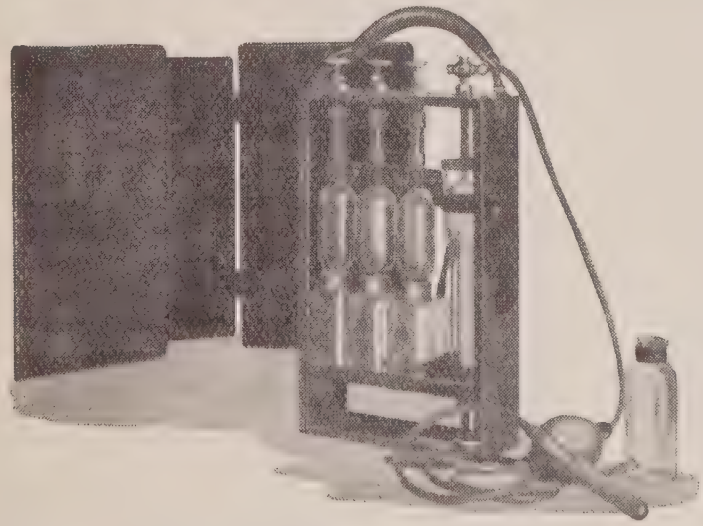
*Heating, Ventilating and Electrical Engineers*

*Works and Head Office*
TROWBRIDGE

*Also at* LONDON, MANCHESTER, BIRMINGHAM, GLASGOW, DUBLIN, LINCOLN, BRISTOL, BOURNEMOUTH, NEWCASTLE, TORQUAY, LIVERPOOL, EASTBOURNE

---

**CO2 TESTS AT THE RATE OF ONE PER MINUTE ! !**



HAYS PORTABLE GAS ANALYSER.

The above analyser is still the most suitable instrument for making rapid, accurate, tests of the CO2 percentage in flue gases. Also deals with Oxygen and Carbon Monoxide.

*Full particulars from the makers*

**DUGUIDS LTD., LYMM, Cheshire**

---

"AIRCLAR"
STOPS
SMOKE

On All Grades of Coal
Cheap and Easy to Install.

Demonstrations can be given
at any time in—
LONDON & MANCHESTER

AIRCLAR & CO.
53, VICTORIA STREET,
LONDON, S W. 1

The emission of smoke from down-draught kilns cannot be restricted to short periods ; it is fairly continuous for 48-72 hours, though greater at some periods than others.

4. *Newcastle kilns* are rectangular structures with a series of fireplaces at one end and a chimney at the other. They are frequently built in pairs, back-to-back, in which case the fires are at both ends and the chimneys in the middle.

So far as smoke-emission is concerned, they are intermediate between up-draught and down-draught kilns and need not be separately considered. They are not used extensively in the Midlands, but are largely used elsewhere.

**The Continuous Kiln.**

5. *Continuous or Hoffmann kilns* are extensively used. There are many variations and patterns, but only two need be considered, namely (i.) those in which the fuel is burned in brickwork " pillars " ; and (ii.) those in which the fuel is burned on grates.

The principle on which these kilns work is simple. The flames, hot gases, and smoke from the fuel are distributed among the bricks and pass forward, heating the bricks and having their own temperature lowered until they contain only sufficient heat to cause them to rise up and pass out of the chimney. The finished bricks are cooled by a current of air passing through them and then used to ensure the proper combustion of the fuel.

If such kilns were ideal in dimensions, if only certain types of fuel were used, and if the bricks were free from carbonaceous matter and required no reduction of the iron compounds present, no smoke would be produced under normal conditions of use. Unfortunately these ideals are seldom realised for the following reasons :

(*a*) For financial reasons, many continuous kilns are built much shorter than they should be. If capital cost were no object, no wise brick manufacturer would have a continuous kiln, with less than 24 chambers, but, actually, most kilns in use have only 12 or 16 chambers. The result is that ideal conditions of burning cannot be realised in such " short " kilns.

(*b*) A continuous kiln depends for its efficiency and smokelessness on being worked at a perfectly regular rate, day and night, continuously. In practice, this is impossible, for no removal of finished bricks, and no insertion of fresh bricks takes place on Saturday afternoons, Sundays, and Bank Holidays. These irregularities cause corresponding variations in the working of the kiln and so produce a variable amount of smoke.

(*c*) The material of which the bricks are made varies considerably from day to day and this causes still further variations in the working of the kiln and in the amount of smoke produced. In this connection is included the effect of carbonaceous matter in the clay.

(*d*) The fuel is added in small quantities once every 20 minutes when all is going well, but both the amount supplied and the intervals between the additions must be varied to suit the bricks and the stage of burning reached. Sometimes very large variations are needed and as a result smoke may be produced almost continuously for several hours until normal conditions are restored. Some kilns are provided with automatic fuel-feeders, but these cannot be used with some clays and with some fuels. They reduce the amount of smoke produced by careless or inefficient firemen, but they do not eliminate it—particularly with some clays.

(*e*) A sudden demand for bricks usually results in too many being drawn from the kiln. This may be justifiable on financial grounds, but it upsets the working of the kiln and is almost invariably followed (though not immediately) by a greater production of smoke.

(*f*) When a continuous kiln is provided with grates on which the fuel is burned, instead of the " pillars " used in other continuous kilns, the fuel is supplied in larger quantities and at longer intervals. This invariably produces smoke unless all the conditions are ideal. The emission of smoke cannot be restricted to three minutes per half hour or in any such manner because the fuel must be supplied to meet the temporary requirements of the bricks.

In short, continuous kilns cannot be supplied with fuel strictly according to a time-quantity schedule, as this will result in many of the bricks being spoiled. Many attempts have been made to do this (some patented), but they are only partially successful in the best of cases and in most works would be disastrous.

A well-managed, well-designed continuous kiln will not emit black smoke continuously, but the variations in the requirements of the kiln necessary to produce the desired bricks make it impossible to lay down any limitations as to when such smoke shall or shall not be emitted.

6. *Gas-fired kilns* are, as the name implies, heated by gas—usually of the kind known as " producer gas." On the whole, such kilns are smokeless, but if coal is used for producing the gas, there will be occasional intervals of intense smoke.

Gas-fired kilns are sometimes used for firebricks and gas-fired tunnel kilns (in which the bricks are placed on cars or trucks) are being increasingly used for building bricks, but they are too costly to be used for most ordinary bricks, both in first cost and in the cost of converting the fuel into gas. For the purposes for which they can be used, gas-fired kilns are excellent in every respect, but for ordinary bricks the cost of using them is excessive. For this reason it is impracticable to convert existing kilns into gas-fired kilns.

*Tunnel kilns* in which the bricks are burned on trucks, are likely to be used increasingly in the future. They are usually gas-fired.

7. *Oil-fired kilns* resemble gas-fired ones in being, on the whole, smokeless, but oil is—under normal conditions—so much more costly than coal per thousand bricks burned, that the substitution of oil for coal is at present impracticable for financial reasons. The technique for the use of oil for multi-coloured bricks has not been worked out.

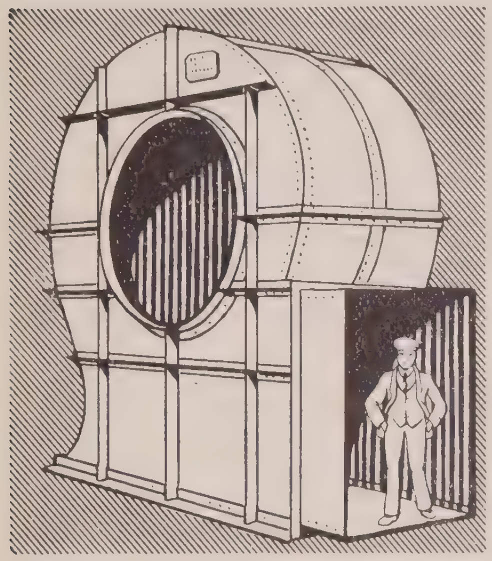
For blue bricks and others where a strong reducing action is needed, oil-burning appears to be impracticable at present.

8. *Electrically heated kilns* are used for some kinds of pottery, but they are too costly for buring ordinary bricks.

**Smoke Preventing Devices.**

The general principles by means of which the production of smoke can be prevented are well known and are as follows :

1. The particles of fuel can be reduced to a fine powder and mixed with the requisite amount of air (10 cubic feet per 1lb. of coal). This method is almost in its infancy. It has been used with



INCREASE YOUR BOILER EFFICIENCY...

The "Cyclone" System of Induced Draught effects a definite saving in Fuel Costs. It spells a double efficiency - a substantial increase of steam power - and the elimination of black smoke.

The low initial cost of installation is an incentive to take advantage of this application to Boiler efficiency of the latest scientific principals. You will find this claim substantiated by the facts set forth in Brochure 66F. Please write for a copy.

- *Write for Brochure 66F.*

**MATTHEWS & YATES LTD**
**SWINTON MANCHESTER**
*London Office :* 20, *Bedford Row, W.C.* 2.

Make your
CENTRAL HEATING
RUN ITSELF!
SET THIS - THATS ALL!

DOES your Central Heating need constant attention? Is it proving heavy on fuel ......unnecessarily expensive? Install a 'Parwinac' Automatic Oil Burning Heater. Controls Heating at an evenness hitherto unobtainable.

*Send name and number of present Boiler with Maker's Name and stating electricity available, A.C. or D.C. Ask for List O.B.742*

**Parker, Winder & Achurch, Ltd.**
Broad St. Birmingham

London, 4 Gt. Marlborough St., W.1.
Manchester, 16 John Dalton St. &
also at Leicester and Coventry.

*Parwinac*
**AUTOMATIC**
**OIL BURNING HEATER**

O.B.M.

ECONOMISE FUEL

BY USING THE

SEOTOO
FLUE GAS
CARBURETTOR
In Your
BOILER FURNACES.

SEND ALL PROBLEMS
RELATING TO COMBUSTION
TO

**Smoke Prevention Limited**
1 Victoria St., London. S.W. 1

some success in burning firebricks, but has been unsatisfactory with building bricks—possibly through lack of sufficient investigation.

2. The ordinary coal is supplied with hot secondary air (above the fuel-bed) admitted in such a manner and at such a temperature that the tarry and other smoke-producing matters are burned under conditions which prevent smoke. The result is usually the production of short flames which are excellent for some furnaces, but useless for kilns, as long flames are required in most kilns.
3. The smoky gases are treated with a current of hot air or are passed through some form of smoke-destroying material. Such arrangements are useless for kilns as they destroy one of the important characteristics of the gases used in kilns, namely, flames of great length, the combustion of which is prolonged by the presence of hydrocarbons in the gases.
4. The fuel can be converted wholly into gas (producer gas) which, under normal conditions, burns without smoke.

Many attempts have been made to apply various smoke-preventing devices based on these principles to kilns, but most of them have been failures for obvious reasons.

The fireplaces use in up-and-down-draught kilns are too small to permit the kind of smoke-preventers used on boilers being used.

Several smoke-preventing devices which can be applied to small fireplaces are useless for kilns because they produce short flames which are wholly unsuitable.

The nearest approach to rendering intermittent kilns smokeless, consists in building deep fireplaces instead of the present type, so as to produce a series of semi-gas producers. It is necessary to inject steam and air into each fire and to provide flues at each side through which hot air can be supplied to the gas produced.

This arrangement greatly increases the amount of labour and attention required during the burning and it has proved unsatisfactory with some bricks. It cannot be used as a certain means of preventing smoke, but it is the best arrangement yet devised for intermittent kilns.

Much work will be needed before it or some similar device can be applied to such kilns.

The exclusive use of gas is impracticable for many kinds of bricks—partly for technical reasons and partly because the use of producer-gas is too costly, being about one-third more than that of direct-fired coal.

The devices used for preventing or destroying smoke in boilers and various industrial furnaces cannot be applied to kilns because they all produce flames of a character unsuitable for kilns.

In *intermittent kilns* (up-and-down-draught kilns) no satisfactory means of preventing the emission of smoke have yet been found, though many attempts have been made.

In *continuous kilns* which have been well designed and are worked under ideal conditions with bricks made of material free from carbonaceous matter, little or no smoke is produced. Very few bricks of this kind exist and inevitable variations in the working of the kilns, due to holidays and irregularities in trade, involve changes in working which must cause smoke to be produced—sometimes in large quantities for several hours at a time.

*Gas-fired kilns* are largely smokeless, but emit smoke occasionally during cleaning and at irregular periods of burning. These periods of emission last much longer than three minutes—sometimes for several hours. Apart from this, gas-fired kilns are not suitable for all kinds of bricks and are (at present) too costly for ordinary bricks.

*Electrically heated kilns* cannot, at present, be used for bricks.

The complex nature of the changes which occur in the burning of kilns makes a comparison with boilers and most furnaces impossible. It would also make the operation of a " three minute " clause impracticable, because kilns are not fired in the same way as boilers, nor is the application of heat the same as in the boilers and furnaces to which such a clause is primarily applied.

If an Act were to be passed prohibiting the emission of smoke from kilns, only three methods of treatment appear to be available :

(i.) To convert all existing kilns into gas-fired ones, disregarding the cost.

(ii.) To draw off the kiln gases into a purifying plant in which they are washed, the solid particles retained, and the clean gas liberated. Such a plant is very costly to instal and to run, though it is quite efficient. It is used in other industries, but only in those in which a specially pure atmosphere is essential.

(iii.) The Lodge-Cottrell method of precipitating dust by means of electrically charged wires is excellent for dusts, but not so good for the relatively thin smoke emitted from kilns. This process would, therefore, have to be modified for application to brick kilns. It might then be effective, but would be far too costly.

### Summary.

*Boilers.*—There are many appliances available for the prevention of smoke from boilers. All the most efficient ones depend on mixing the volatile matter from the coal with a suitable volume of air at a sufficiently high temperature.

*Kilns.*—The only way in which the emission of smoke from kilns can be *completely* prevented, is to collect the smoke and wash it, and this is far too expensive to suit brick and tile manufacturers.

---

A resolution passed by the Engineering section of the British Association, and sponsored by Professor Miles Walker, calling for closer co-operation between the Government and the scientific workers of the country, created a considerable amount of attention during the York meetings of the B.A.

In a subsequent letter to the " Times," Professor Walker illustrated his proposals by a cogent example :—

" Take the matter of smoke in our towns. For years past it has been known that it is far more economical to distil coal and obtain the gas, oil, and brightly-burning fuel from it than to burn it in the domestic fire where the valuable by-products are lost and go to make smoke and fog. A law prohibiting the burning of smoky coal in the open fire has long been overdue, but nothing is done."

FOR CLEAN AIR AND
MAXIMUM SUNLIGHT

USE THE SMOKELESS COKE
NATURE HAS HERSELF PROVIDED

# ANTHRACITE

ABSOLUTELY SMOKELESS
HIGHEST IN CARBON, LOWEST IN ASH
VERY SLOW BURNING
SAFE, CLEAN AND ECONOMICAL IN USE
MINIMUM ATTENTION—IT NEVER GOES OUT

THE BEST FUEL FOR—

- **DOMESTIC HOT WATER BOILERS**
- **CENTRAL HEATING**
- **OFFICE, WAREHOUSE, GREENHOUSE AND GARAGE HEATING**

* * *

*ENQUIRIES AND DESCRIPTIVE LEAFLETS :—*

**AMALGAMATED ANTHRACITE COLLIERIES LTD.**
120, FENCHURCH STREET,
LONDON, E.C. 3.

HODGKINSON'S PATENT AUTOMATIC STOKERS

Are guaranteed to prevent the emission of Smoke and Grits from Industrial Chimneys with the highest Economy and Efficiency and without the use of forced blast Steam Jets.

**JAMES HODGKINSON (SALF'D) LTD.**

**FORD LANE WORKS,**

PENDLETON - MANCHESTER

Telephone :
1491,2,3 Pendleton.

Telegrams :
"Incendo, Manchester."

**Dr. G. E. Foxwell.**

Dr. G. E. Foxwell, who contributed an important article on "Coke Produced in the Bye-Product Coke Oven" in the *Journal* last year is setting up in practice as a consultant fuel technologist, including carbonization, smoke abatement, and all other fuel problems. His address is : 42, Tower Road, Strawberry Hill, Twickenham.

THE JOURNAL OF THE NATIONAL SMOKE ABATEMENT SOCIETY

is undoubtedly the ideal medium in which to advertise Smokeless Fuels and every appliance or device for minimising or abolishing the smoke nuisance. The advertisement rate is very moderate, while advertisers are assured of **every copy** of the Journal reaching the people who are working for this great modern reform. Smoke Abatement is not a theory ; it is not merely hygienic propaganda. **It is a step forward in the life of the nation.** The movement is making wonderful progress ; it is overcoming all old-fashioned prejudices. Its advance is irresistible Every engineering firm which produces smoke-abating appliances, and every maker of smokeless fuels, should openly associate themselves with this great national reform, by advertising their products in the **only** National Journal devoted to Smoke Abatement.

Enquiries as to advertisement space should be addressed to the publishers :

THE SERVICE GUILD

**45, Deansgate Arcade, MANCHESTER.**

*Telephone :* BLACKFRIARS **9374.**

The ADVANCE GUARD of HEALTH and HAPPINESS!

ELECTRICITY—has banished thousands of air-polluting factory chimneys, and to-day in many districts is rapidly reducing the volumes of domestic smoke.

Interesting leaflets on the application of ELECTRICITY to modern uses will be forwarded post free, on request

*to*

**THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION, INC.,**
**15, SAVOY STREET——————STRAND, LONDON, W.C.2.**

---

**ELECTRICITY IS THE ENEMY OF SMOKE**

*The* ADVANCE GUARD *of*
HEALTH *and* HAPPINESS!

ELECTRICITY—has banished thousands of air-polluting factory chimneys, and to-day in many districts is rapidly eliminating the volumes of [illegible] smoke.

[illegible]

THE BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION INC.
15 SAVOY STREET——STRAND, LONDON, W.C.2

ELECTRICITY IS THE ENEMY OF SMOKE